



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

**POLYCHÆTOUS ANNELIDS FROM MONTEREY BAY AND SAN DIEGO,
CALIFORNIA.**

BY J. PERCY MOORE, PH.D.

In this paper are recorded the results of a study of the California Polychæta belonging to the Museum of Leland Stanford Junior University, which were submitted to me at various times by Profs. Harold Heath and W. K. Fisher of that institution. Descriptions of a few new species from San Diego have been published already in these *Proceedings* for 1904, pp. 484-503. The localities at which the collections were made are limited to two, namely: the vicinity of Monterey Bay, at about the middle of the California coast, where Mr. M. H. Spaulding collected in 1903 and 1904, chiefly at Pacific Grove, and San Diego, chiefly on a sand-bar in the bay, near the southern boundary of California, where Prof. E. C. Starks collected during 1902 and 1903. At both places the collecting was nearly limited to the littoral zone between tide limits, though a few dredgings were also made. A few specimens collected at Pacific Grove by Prof. Heath and presented to this Academy some years ago are also mentioned. In all cases where nothing different is stated it will be understood that the specimens were taken between tides and by one of the two gentlemen who made the bulk of the collections. Also, unless otherwise stated, the types of new species are in the Museum of Stanford University. A set of cotypes and duplicates has been added to the collection of the Academy of Natural Sciences of Philadelphia.

The total number of species mentioned is 64, of which 21 are considered to have been previously undescribed. While this must represent a small part only of the Polychæte fauna of that region the records are important because they are in nearly all cases material extensions of the known ranges of the species. Scarcely anything has hitherto been published concerning the Polychæta of the coast of the southern half of California or of the Pacific coast of Mexico and a rich field for faunal investigation remains. When these collections were placed in my hands for study it was hoped that Prof. H. P. Johnson's projected paper on the Polychæta of California would be available for their determination, but this much-desired publication has been unavoidably delayed.

SYLLIDÆ.

Syllis elongata Johnson.

Pionosyllis elongata (Johnson), Proc. Bos. Soc. Nat. Hist., XXIX, pp. 403-405; Pl. 6, figs. 67-70; Pl. 7, fig. 71.

Dredged at Delmonte wharf, vicinity of Monterey Bay, July 12, 1904.

A fine specimen 40 mm. long, with 193 segments, the last 28 or 29 of which are much distended with sperm and elongated to three times the length of the preceding 29 segments. The notocirri are more tapered and acute than represented in Johnson's figure. This species is very slender and in general aspect closely resembles *Syllis gracilis* Grube. At least the dorsalmost seta of many of the middle segments has the appendage coalesced with the stem to form bifurcate setæ as in that species. Probably it should be placed in Verrill's subgenus *Synsyllis*. It certainly departs widely from the type of *Pionosyllis* in the form of its setæ and its strongly moniliform tentacles and cirri. The posterior region is so much enlarged that it seems probable that it separates at maturity.

Trypanosyllis intermedia sp. nov. (Plate VII, figs. 1 and 2).

An imperfectly known species resembling *T. gemmipara* Johnson in general aspect, but readily distinguished from that species by the much longer appendages of its setæ.

Length of the anterior 80 segments of an incomplete specimen, 18 mm.; maximum width between tips of parapodia, 2 mm.

Prostomium quadrate, slightly wider than long, with a median dorsal furrow. Eyes small, red, dorso-lateral; the anterior slightly farther apart and less than one-eighth the width of the prostomium; the posterior pair about one-twelfth the width of the prostomium and separated from the anterior by an equal distance. Palpi about as long as prostomium, projecting forward and widely divergent. Tentacles all missing.

Anterior end of body broad and strongly depressed, becoming gradually less so posteriorly. Segments all extremely short and crowded, especially anteriorly, where they are slightly biannulate. Pygidium unknown.

Parapodia uniramous, short, stout and slightly notched distally. Neurocirri short, cylindrical, rounded distally, and arising from middle of ventral face of neuropodia, the end of which they scarcely reach. Notocirri arising from prominent cirrophores immediately above the base of the neuropodia; styles very readily detached and only a few remaining so that their relative length is unknown, those remaining rather stout, swollen beyond base and thence tapered to the blunt

end, the longer ones about equal to total width of worm and with about 20 short articles, the shorter two-thirds as long with about 15 articles.

Acicula three, tapered, with the ends blunt, slightly flattened and just perceptibly enlarged. Setæ few (about 9-11), all subacicular, colorless, with rather strongly curved stems acutely beveled at the end, smooth, with a slight shoulder for attachment of the appendage (Plate VII, figs. 1 and 2); length of appendages varying from one and one-third times (on posterior parapodia) to more than twice (on anterior parapodia) the distal thickness of the stems, their distal ends hooked and conspicuously bifid, the teeth being much more widely separated on posterior setæ, on which also the marginal fringe is much less developed.

The single incomplete specimen was taken at "point above Third Beach," vicinity of Monterey Bay, July 12, 1904.

PHYLLODOCIDÆ.

Phyllodoce medipapillata sp. nov. (Plate VII, figs. 3 and 4).

The two examples upon which this species is based differ greatly in appearance and degree of contraction, one being robust, the other very slender. Length of type 100 mm., maximum width of body 1.8 mm., total width including parapodia 3.5 mm.; number of segments 201. Length of cotype 170 mm., width of body 3.5, total width including parapodia 8 mm.; number of segments 240.

Prostomium rather thick, depressed, broad, slightly cordate behind; about as wide as long, the greatest breadth at the eyes about one-third of the length from the posterior end, the sides very strongly convex at this point; anterior border broadly rounded, projecting slightly beyond tentacles. Eyes circular, their diameter about one-eighth to one-tenth width of prostomium, at the widest part of which they are situated, separated by about one-half its width. The tentacles, which arise from a shallow annular depression, short conical, diverging equally in both directions, about as long as one-third width of prostomium. Nuchal organs everted as prominent knobs between sides of prostomium and peristomium just below eyes. A minute nuchal tubercle, about one-third diameter of nuchal organs, occupies the posterior emargination of the prostomium.

Peristomium and somite II coalesced, achætous, nearly concealed above by the prostomial lobes, between which the nuchal tubercle projects; below forming a smooth, somewhat swollen lip. Except in the character of its parapodia III is similar to succeeding segments. Tentacular cirri all short, with distinct cirrophores and rather stout

styles tapering to delicate tips. On the type they reach to the following segments; that of I to VII, dorsal of II and III both to IX, ventral of II to VI or VII. On the cotype, which has the anterior segments much contracted, each reaches about three segments farther caudad.

The body of the type is slender, slightly depressed, flattened ventrally, widest in anterior fourth, and tapers regularly caudad; the length of the segments varies from one-fifth the width anteriorly to two-thirds width posteriorly. As noted above the cotype is much contracted and consequently much stouter. Pygidium unknown.

Parapodia (Plate VII, fig. 3) uniramous, prominent, strictly lateral, posteriorly equaling width of somites. That of I a tentacular cirrus (neurocirrus) only; of II dorsal and ventral tentacular cirri (notocirrus and neurocirrus); III the first setigerous. Typical parapodia consist of somewhat flattened neuropodia supported by a single, stout, tapered aciculum and divided at the distal end into a low, entire post-setal lip and a slightly more prominent presetal lip divided by a notch into supra-acicular and subacicular lobes, to the dorsal border of the latter of which the slightly curved end of the aciculum is adherent.

Foliaceous notocirri begin on IV and foliaceous neurocirri on III; both are prominent and the former strongly imbricated on the dorsum of the parapodia. Notocirrophores prominent, erect, well separated from the neuropodia, more than half as long as the latter and equally broad. Styles not strongly asymmetrical, with basal auricles only slightly developed, those of anterior segments nearly regularly ovoidal, with bluntly rounded ends and about two-thirds as wide as long. Farther back they increase in size and become more slender (twice as long as wide) and more acutely tipped, without any trace of the truncate end seen in so many species, though the tips of some are slightly recurved. On middle somites they approach nearer to the ovate-lanceolate form usual in *Eulalia* rather than the form usually characterizing *Phyllodoce*. In the posterior third they again become shorter and broader—much like poplar leaves—with rather abruptly acuminate tips. Rather firmly attached, of thin, membranous texture and with a striated border of colored glands. Neurocirri attached by low, broad cirrophores to the bases of the neuropodia. Styles all very large and foliaceous and projecting one-third or more of their length beyond the neuropodia. On the first few segments they are very broad and subelliptical, but soon become more acute and asymmetrical and gradually much more elongated and slender.

Setæ (Plate VII, fig. 4) all colorless, in fan-shaped supra- and sub-

acicular fascicles of (in the type) from eight (on IV) to twenty-six (on XXV), decreasing to eleven or twelve at *CL*, the cotype bearing about one-third as many more. Stems slightly curved and slightly enlarged distally to form an oblique socket, each side of which bears a small brush of hairs, none of which is enlarged. Appendages very long, slender, tapering, slightly curved, with a border of minute serrations; their length is from more than one-half to nearly the depth of the neuropodia and they vary little in the different regions.

Proboscis of type fully extended, clavate, 7 mm. long, 1.8 mm. in distal and 1.2 mm. in basal diameter. Orifice surrounded by nineteen rather prominent, compressed ovoid papillæ. Greater part of surface smooth, with six very obscure longitudinal ridges becoming gradually more roughened toward the base. Papillæ confined to basal one-sixth or less, arranged in six longitudinal rows on each side separated by dorsal and ventral intervals, of which the former is the greater and about equals the width of the papillated areas. The papillæ are slightly flattened and the posterior face is brown. Each row contains from nine or ten (ventral) to twelve (dorsal), the increased number resulting from a few papillæ placed irregularly at the anterior end of the more dorsal rows. In addition to the paired series, about four or five very small papillæ form an irregular dorso-median row. Except for the greater contraction the proboscis of the cotype is exactly similar.

Color of type confined to a brownish tinge on the dorsum and notocirri; cotype uniform purplish-brown.

Type locality, vicinity of Monterey Bay, M. H. Spaulding. The cotype was taken at San Diego by E. C. Stark.

Phyllodoce (*Carobia*) *castanea* Marenzeller.

Carobia castanea v. Marenzeller, Denkschr. K. Acad. Wissensch., Wien, XLI (1879), Math-naturw. Cl., 2d Abth., pp. 127, 128, Tab. III, fig. 2.

A much contracted specimen which agrees very closely with v. Marenzeller's description was dredged by Mr. Spaulding on July 12, 1903, at Delmonte wharf, near Monterey Bay. Length 21 mm.; segments 160.

Prostomium regularly subovate, about as broad as long, truncate posteriorly with a very slight median emargination; no anterior constriction or furrow. Eyes very large, dorso-lateral, about one-fourth diameter of prostomium and about an equal distance apart. Tentacles lateral and ventro-lateral, near anterior end of prostomium, directed almost laterad and very little forward, acutely subulate, thickened toward base, the dorsal pair as long as prostomium, the ventral two-thirds as long.

Tentacular cirri very much crowded, slightly flattened, very short, the longest (dorsal of II) about four times length of prostomium and reaching VII, the shortest (ventral of II) about twice prostomium, the remaining two subequal and about two and one-half times prostomium. Peristomium and II coalesced and scarcely visible from above. There may be a minute nuchal tubercle, but this is uncertain. Pygidium a minute ring bearing a pair of short, subulate cirri.

Notocirrophores low and broad, styles rather thick and easily detached, in this specimen carried nearly erect over the parapodia; broadly foliaceous, nearly uniform in size and shape throughout, triangular ovate, about three-fifths as wide as long with rounded apex and oblique but not auriculate base, the markings arranged bipinnately from a central axis.

Neurocirri foliaceous, subquadrate elliptical, all free surfaces evenly rounded, very broadly attached to venter of neuropodium and carried posterior to the latter, scarcely reaching beyond end of neuropodium.

Aciculum single, stout, tapered, straight. Setæ in spreading, vertical series, colorless, transparent, rather stout, with curved stems rather abruptly enlarged distally, the margins of the socket bearing a single series of rather long hairs. Appendages short, their length not exceeding one-third depth of parapodia, very delicate, broad at base but rapidly tapering to a tenuous tip; marginal serrations scarcely visible. Six supra- and ten subacicular setæ on middle parapodia.

Color pale reddish-brown, brightest on notocirri and anterior dorsum of body. Female with immature eggs.

POLYNOIDÆ.

Halosydna pulchra (Johnson).

Polynoë pulchra Johnson, Proc. Cal. Acad. Sci. (3), Zoology, I (1897), pp. 177-179, Pl. VII, figs. 34, 43a; Pl. VIII, figs. 50-50b.

Three specimens occur in the collection, two certainly from the Monterey Bay region, the other unlabeled but probably from the same place. Of the first two one was commensal on the holothurian *Stichopus*, the other on *Cryptochiton*. The latter is a fine specimen with milk-white elytra marked with a small, round, clear-cut black spot over the area of attachment.

Halosydna brevisetosa Kinberg.

Halosydna brevisetosa Kinberg, Ofver. K. Vetensk. Akad. Forh., XII (1855), p. 385.

Two small specimens were taken at San Diego, others in the vicinity

of Monterey Bay, at "big tide pool, Lighthouse Point," on June 28, 1904, and at "point above Third Beach," on July 12, 1904.

All of the specimens are dark colored, with heavily mottled elytra.

Halosydna reticulata (Johnson).

Polynoë reticulata Johnson, Proc. Cal. Acad. Sci. (3), Zoology, I, pp. 170, 171; Pl. VII, figs. 32-41a, Pl. VII, figs. 47-47b.

Eleven specimens from San Diego occur in the collection and only two from Monterey Bay, where they were dredged on July 9, 1904.

These specimens exhibit considerable variation. Some are almost pigmentless and of a nearly uniform pale yellow, gray or brown; others are thickly mottled with deep brown on the elytra and barred on both dorsal and ventral surfaces of the body. Usually a brown spot or ring is present on the elytra over the point of attachment. The elytra differ greatly in the degree to which the surface is roughened with conical projections and in the number of marginal cilia. The latter appear to be gradually lost with increased age and size. They are plentiful on the elytra of small specimens and on newly regenerated elytra, fewer on those of medium size and frequently totally absent from larger specimens, as is the case with the two from Monterey Bay. As a result of loss and regeneration the elytra of some specimens are of very unequal size. The labels give no information concerning commensalism.

Lepidonotus cæloris Moore.

Lepidonotus cæloris Moore, Proc. Acad. Nat. Sci. Phila., 1903, pp. 412-414, Pl. XXIII, fig. 12.

A solitary specimen of small size was dredged at Delmonte wharf, Monterey Bay, on July 12, 1904.

Lepidasthenia gigas (Johnson).

Polynoë gigas Johnson, Proc. Cal. Acad. Sci. (3), Zoology, I, pp. 172-175; Pl. VII, figs. 33, 42b; Pl. VIII, figs. 48, 49.

Three examples from San Diego. One has the parapodia much entangled with Terebellid tentacles and probably came from the tube of the *Amphitrite* with which Johnson states that it lives commensally. Notopodial setæ are more usually present in the anterior parapodia, and the first parapodium bears a single seta of a form intermediate between the typical notopodial and neuropodial types.

One specimen 89 mm. long and having 83 somites has the elytra arranged in symmetrical pairs, except on somite LXV, which bears the right one only, the left side bearing a notocirrus; there are 39 pairs on the segments numbered 2, 4, 5, 7, 9, 11, 13, 17, 19, 21, 25, 27, 28, 30,

31, 33, 35, 37, 39, 41, 43, 45, 47, 48, 52, 54, 55, 56, 58, 60, 61, 62, 66, 67, 68, 69, 70, 71, 72.

SIGALEONIDÆ.

***Sthenelais fusca* Johnson.**

Sthenelais fusca Johnson, Proc. Cal. Acad. Sci. (3), Zoology, I, pp. 185-186; Pl. IX, figs. 60-61*b*, Pl. X, figs. 64, 64*g*.

Two examples from San Diego and one from Chinatown Point, August 12, 1904.

One specimen is 110 mm. long with 172 pairs of elytra; the other is about the same size, but the number of elytra was not counted. The first mentioned has a caudal regenerating region of about a dozen segments, so that it is probable that the species reached a considerably larger size than the original description indicated. The first pair of elytra is pale and without markings, the others are of a darker brown, thickly and finely mottled with a reticular pattern of black. The pygidium, which was not described by Johnson, bears a pair of subanal cirri about as long as the last six or seven segments and of slender, tapered form. The distal papillæ of both rami of the parapodia are frequently more numerous than indicated in Johnson's figure.

***Peisidice aspera* Johnson.**

Peisidice aspera Johnson, Proc. Cal. Acad. Sci. (3), (Zool.), Vol. I, pp. 184, 185; Pl. IX, figs. 56-59; Pl. X, figs. 63*a-d*.

A single specimen with twenty-one pairs of elytra, dredged at Delmonte wharf, vicinity of Monterey Bay, on July 12, 1904, represents this species in the collection.

AMPHINOMIDÆ.

***Eurythoe californica* Johnson.**

Eurythoe californica Johnson, Proc. Calif. Acad. Sci. (3), Zoology, I, pp. 184, 185; Pl. IX, figs. 56-59, Pl. X, figs. 63-63*d*.

This species is represented in the collection by about a dozen specimens from San Diego and a single one from Monterey Bay, collected on July 12, 1904, from the "point above Third Beach."

Johnson gives no account of the proboscis, and as one of the specimens has it protruded the following brief description is added. It is about 3 mm. long and 1.8 mm. in diameter, subcylindrical, but slightly compressed and slightly wider distally than at the base. It terminates in a firm elliptical disk, with a vertical slit open ventrally and a central depression in which the mouth lies; surrounding this disk is a low annular fold. The cuticle is everywhere smooth, without papillæ, jaws or teeth of any kind.

HESIONIDÆ.***Podarke pugettensis* Johnson.**

Podarke pugettensis Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), pp. 397, 398; Pl. 3, figs. 23-25.

About fifty specimens collected at San Diego are stated to have been "parasitic on starfish."

The occurrence of this species on a starfish (*Luidia*) in the vicinity of Port Townsend has been already reported in these *Proceedings* for 1908 and it seems probable that this habit is general. The reference by Harrington and Griffin in their paper on Puget Sound Invertebrates to "the curious *Ophiodromus*, an annelid that lives between the arms of the starfish [*Asterias*] and is colored so as to resemble the surface of the latter," probably relates to this species.

The appendages of some of the dorsalmost setæ of the subacicular fascicle and the ventralmost of the supra-acicular fascicle are much longer and more slender than the others.

NEPHTHYDIDÆ.***Nephtys cæca* (Fabricius) Oersted.**

Nereis cæca, Fabricius, Fauna Groenlandica, 1780, p. 304.

This species is represented by six large specimens from the vicinity of Monterey Bay and by about twenty from San Diego, where it appears to be common and was taken from the littoral zone and down to a depth of fifty feet.

The San Diego examples are of small to medium size and colorless or slightly marked with brown figures and bands on the prostomium and a few anterior segments. The setæ of some specimens are long, of others short and one of the latter is filled with nearly mature ova.

Those from Monterey Bay are much larger, measuring about 180 mm. in length and one counted having 152 segments. Three of them are very smooth and colorless, except that there is a brown or black "spread-eagle" figure on the prostomium and crossbars on a few anterior segments. The others have the body of a deep purplish brown both dorsally and ventrally, the parapodia colorless.

The free margins of the prostomium are thin and produced. The serrated setæ form long flowing tufts, dusky at the base, as long as the parapodia or nearly equal to the body width. The annulated setæ are short and small, except on anterior parapodia. Several specimens have the single caudal cirrus intact.

The extended proboscis is rather slender clavate with ten bifid orifical papillæ above and ten below and twenty-two longitudinal

rows of conical papillæ of usually five each, the unpaired dorsal and ventral papillæ being no larger than the others.

No characters distinguishing these specimens from examples of the species from the Atlantic Ocean are obvious.

NEREIDÆ.

Nereis procera Ehlers.

Nereis procera Ehlers, Die Borstenwürmer, 1868, pp. 557-559; Taf. XXIII, fig. 2.

Ten specimens were taken in the vicinity of Monterey Bay, two bearing each of the following labels: Point about Third Beach; Big tide pool, Lighthouse Point, June 20, 1905, and June 28, 1904; dredged July 9, 1904, and dredged Delmonte wharf, July 12, 1904. Of the three from San Diego one is 3 mm. in diameter and filled with large eggs. The parapodia and other parts exhibit no epitokous modification.

Nereis (Alitta) vexillosa Grube.

Nereis vexillosa Grube, in Middendorff, Reise in Sibiriens, etc., II, 1851, p. 4; Taf. II, figs. 1, 5, 6.

Taken at San Diego only; 14 small atokes and one small female epitoke. The largest of the atokes is 50 mm. long, and all of them have the notocirral laminæ much less developed than on larger specimens. One exerted proboscis has paragnaths arranged as follows: I, three in a longitudinal series; II, tapering arcuate groups of three rows of small cones; III, transverse band in three rows; IV, wider curved band, broader behind; V, absent; VI, four large cones in lozenge-shaped figure; VII and VIII, broad transverse band encircling ventral and lateral portion of basal ring, a tract of very small paragnaths in front of ventral part.

The epitoke is filled with large eggs. The parapodia agree with Johnson's figure, but the setæ are arranged somewhat differently. Those of the dorsal rami are all of the "fish-bone" type, the stout compound setæ belonging to the dorsal supra-acicular fascicle of the neuropodium. The paragnaths exhibit several peculiarities; their number is generally reduced, those of VI are coalesced into a single large one on each side; V is present as a single cone.

Nereis (Alitta) virens plenidentata subsp. nov.

Under this name I am recording provisionally a species of *Alitta* that appears to be quite common on the sand-bars in San Diego Bay. The northern Pacific species, which is found from Ochotsk Sea and Alaska south nearly to San Francisco, seems to differ from Atlantic examples of *A. virens* in several respects, and particularly in having

more numerous paragnaths and a greater number of segments. Probably it must be considered to be at least a subspecies under the name of *brandti* Malmgren.

These specimens from southern California exhibit more extreme divergence in the same direction. Like both of the forms mentioned the paragnaths are reduced in number with age and increased size, but compared with specimens of the same size they are very much more numerous. For example a specimen 150 mm. long and 8 mm. wide between the tips of the parapodia and having 218 segments¹ has the hard, black, strictly conical paragnaths arranged as follows: I, 3 in tandem; II, small groups of 7-9 in two oblique rows; III, broad dense, transverse band of small cones chiefly arranged in longitudinal or somewhat oblique lines of six or seven each, with numerous shorter lines and small groups uniting them anteriorly; IV, dense, somewhat arched, dumbbell-shaped groups of small cones, from three to five across and tending to coalesce at their posterior ends with the lateral borders of III; V, a diffuse subcircular area spreading laterally to the level of VI and with a median row of four large paragnaths reaching anteriorly beyond the others; VI, a compact group of four or five large cones forming a lozenge-shaped figure; VI and VII coalesced and forming a broad zone encircling the basal ring of the proboscis below the level of VI and nearly joining V above, the numerous cones (from six to ten in the width of the band) increasing in size and becoming more distant anteriorly and dorsally.

The tentacles are also longer and most of the specimens are noteworthy for the deep brown pigment deposited in the lamellar notocirrophores.

The relations of this form to *N. virens* and *brandti* will be discussed fully at another time, when I hope to have for comparison specimens from other parts of the California coast.

N. foliata Baird evidently applies to the northern form; *N. chilensis* Ehlers (= *Thoosa Gayi* Kinberg) is not at present recognizable, and there appears to be no name for this southern form.

Nereis (Platynereis) agassizi Ehlers.

Nereis agassizi Ehlers, Die Borstenwürmer, 1868, pp. 542-546; Taf. XXIII, fig. 1.

A few small specimens were taken at San Diego and two at Monterey Bay, one of the latter dredged and one between tides at the "point above Third Beach."

¹ A specimen of *N. virens* from New Jersey of the same size has 130 segments.

The San Diego specimens are noteworthy for the very conspicuous notopodial spots and in one case for the equally conspicuous spots on the pygidium. The example dredged at Monterey is filled with small eggs and has the eyes enlarged, but is not otherwise modified.

EUNICIDÆ.

Eunice (Eriphyle) paloloides sp. nov. (Plate VII, figs. 5-7).

The type of this species is a nearly complete worm closely related to the celebrated "palolo" (*Eunice viridis*) which it resembles in form. It consists of a thicker anterior non-sexual region of about 200 segments and a slender posterior sexual region of more than 550 segments. Owing to the softening of a portion of the worm the exact point of transition cannot be determined and accurate measurements cannot be given. The size and proportions, however, closely approximate those of *E. viridis*.

Prostomium (somewhat distorted by protrusion of the jaws) about twice as wide as long, broadening anteriorly where it is divided into two short, wide, broadly rounded lobes by a shallow emargination which continues caudad as a dorso-median furrow; a transverse furrow passes across the posterior ventral part of each of these frontal lobes. Five tentacles arranged in a nearly straight transverse line, the middle one being slightly behind the others and in contact with the nuchal fold. Middle one slightly the longest ($1\frac{1}{2}$ times length of prostomium), the lateral shortest and separated from the second pair by a wider space than separates the latter from the median. All regularly tapered and transversely wrinkled, but not beaded or articulated. Eyes conspicuous, with large lenses, situated between the outer and inner paired tentacles close to base of latter. On one side a rather conspicuous pigment spot lies just anterior and external to the lateral tentacle.

Peristomium a slightly swollen naked ring considerably longer than the prostomium and forming a distinct nuchal fold dorsally, but little swollen laterally. Somite II is a short, simple, apodous ring bearing, close to the anterior border, and on a level with the lateral tentacles, a pair of short conical nuchal cirri slightly longer than the segment.

Segments of anterior region very short, flattened and concave below, at first strongly arched above but gradually becoming flatter and more depressed. Owing to the poor preservation of the segments following CC it is not possible to determine at just what point the epitokous sexual region separates, but a marked softening of the tissues and the enlarged size of the neural eye-spots (phototactic organs) on

subsequent segments indicates that it probably occurs at *CCX*, though eye-spots of smaller size appear abruptly at *CLII*.

The epitokous region is very slender, subterete or slightly depressed, with a well-defined neural groove and distinct furrows separating segments generally about three times as wide as long. Surrounding each segment in the parapodial zone is a raised glandular band, sometimes single but oftener formed of two lines. Posteriorly the body tapers and is composed of numerous very small segments—evidently a rapidly proliferating region. The ventral eye-spots form a neural series of usually two spots to each segment: one on the glandular girdle, the other at the intersegmental furrow, sometimes one, sometimes the other being larger and frequently one or both subdivided.

Pygidium tubular and somewhat elongated, obliquely truncated with the small anus facing dorsad; posterior to anus two pairs of conical caudal cirri, of which the dorsal pair is about as long as the diameter of the pygidium and nearly three times the ventral.

Parapodia uniramal. Typical parapodia of the anterior region consist of a short, broad, truncate neuropodium, bearing a low post-setal fold behind the compound setæ and a small presetal lobe in front of the simple setæ. The simple notocirrus springs without a cirrophore from above the neuropodium and is a bent, slightly tapered blunt process reaching a short distance beyond the distal end of the foot. Neurocirrus consists of a low glandular elliptical cirrophore adnate to the side of the segment ventral to the parapodium and bearing a small, blunt, cylindroid or conical style. Farther back all parts and particularly the cirri are gradually reduced in size. The first parapodium (on *III*) has the setigerous lobe rudimentary, bearing only two or three setæ, and consists chiefly of a simple notocirrus and neurocirrus nearly in contact, the former shorter and stouter, the latter about twice as long, more slender, obscurely articulated and more or less bent into a bow. Several succeeding parapodia are transitional to the typical form, springing from a gradually rising level, the neuropodium gradually increasing in size and the cirri becoming smaller. In the epitokous region the entire foot is much smaller, the neuropodium a conical process whose outlines pass into the dorsal and ventral curvatures of the segments, the notocirrus a minute conical process above the foot and at the base of the gill, and a similarly formed neurocirrus arising from a thick glandular ventral area or cirrophore.

Gills appear as a pair of minute papillæ on the medial side of the base of the notocirri of *CVII* and increase in length gradually until they become slender tapering filaments having a length of one-half

to one-third the body width, the longest ones in the neighborhood of somite *CC* reaching easily beyond the middle line; in the posterior region they continue nearly to the pygidium and as far as the last one hundred segments reach to the median line.

Acicula anteriorly are three or four, stout, tapered, chiefly very dark brown, the dark tips exposed, blunt, somewhat oblique but not knobbed. Posteriorly there are but two and finally one, and except that they become more slender there is no change in form.

Setæ are of two forms: simple supra-acicular and compound sub-acicular. No pectinate setæ are visible in any of the preparations. Simple setæ have long, slender shafts, dark colored toward the base, but pale distally; they project prominently, the ends being slightly doubly curved and gently tapered to very slender acute tips with a faint marginal fringe but no distinct limbus. Somite III bears only three or four simple setæ, the number increasing to about twenty on X. Behind *C* the number again diminishes, but the setæ become first longer, then very few and of small size on the caudal segments. Compound setæ (Pl. VII, fig. 5) are enlarged toward the distal ends of the shaft which bears a few small marginal teeth, the appendage broad, bidentate and slightly hooked distally and provided with a fringed guard, its length one and one-half times width of enlarged end of shaft and remarkably uniform on all parapodia. They are absent from III and numerous by X, on which they form rows extending anterior to and below the acicula. Farther back they undergo changes similar to those affecting the simple setæ.

Mandibles (Pl. VII, fig. 6) large, very hard, the horny carriers yellowish with dark lines, very thick and firm, with an angular ridge running the entire length. Jaw plates very large, white, calcareous, of stony hardness, each plate bent nearly into a semicircle at the free margin which is faintly denticulated, the dorso-lateral angle freely projecting. Maxillæ (Pl. VII, fig. 7) deep brown, hard. Carriers of forceps jaws broad with lateral emarginations and the two halves closely united except at the caudal end; forceps with broad bases marked by three longitudinal ridges, no masticatory teeth and short, strongly hooked ends. Second pair (II) massive with four stout teeth on the left and three and a rudimentary fourth on the right side. Three accessory jaws (III, IV, V) each with a single tooth on the left side arranged in a semicircle and two, one with two teeth, the other with a single tooth, on the right side.

Color of anterior end deep, iridescent purple, posterior reproductive region of male pale brown, of female greenish drab with white rings. Ventral phototactic organs brown.

Collected by Prof. E. C. Starks at San Diego, Cal. Besides the nearly complete type there is a fragment of the reproductive region of a male and one of a female, both fully mature and probably nearly ready to separate and swarm.

The occurrence of a *Eunice* with the habits of a "palolo" worm on the California coast is of much interest, and it is to be hoped that some zoologist on the ground will determine its life-history and especially the habits of swarming and if possible the conditions affecting it. While the species is closely related to *Eunice viridis* and *E. siciliensis* it is readily enough distinguished from both.

***Eunice biannulata* Moore.**

Eunice biannulata Moore, Proc. Acad. Nat. Sci. Phila., 1904, pp. 487-490; Pl. XXXVII, figs. 10-18; Plate XXXVIII, fig. 42.

San Diego, type and cotype only.

***Morphysa stylobranchiata* sp. nov. (Plate VII, figs. 8-12).**

Form moderately stout. Length about 100 mm., the longest 110 mm. long and 4.5 mm. in maximum width at about XXX. Number of segments 142-160.

Prostomium about one-half as wide as long, divided anteriorly into two broadly rounded prominent entire lobes which exhibit no ventral furrow or swelling. Tentacles five, smooth, short, thick, sausage-shaped, arranged in a slightly curved row near the posterior end of the prostomium; middle one longest, nearly equal to length of prostomium, the outer pair shortest, about two-thirds length of middle tentacle. Eyes small, behind interval between outer and middle tentacles, or absent.

Peristomium about three times as long as first setigerous segment, perfectly naked, divided into two rings probably representing segments, the posterior slightly more than one-half anterior, from which it is separated by a continuous faint groove. Laterally the anterior ring projects somewhat forward and is united with the sides of the prostomium, thus concealing a small internal or mandibular lobe. Remaining segments well defined by deep furrows, all short, strictly uniannular, generally one-sixth to one-eighth as long as wide. To about somite VIII the body is quite terete, but soon becomes wider than deep, the ratio in the middle region being about as five to three. Posteriorly the body tapers, first gently, then rapidly, to the pygidium, which is short, annular, radially furrowed or rosetted and bears a pair of rather stout, tapering ventral cirri as long as the last five or six segments and below these a second pair of minute cirri.

Parapodia strictly uniramous, lateral, the first five or six more ventral than the others. Neuropodium short, stout, bearing a fleshy post-acicular lobe on anterior parapodia which disappears on middle and posterior ones. Anterior to this is a row of conspicuous black acicula and a rather complex group of setæ. Notocirrus of first parapodium (III) rather stout, conical, tapering, simple, free from but immediately above foot and about twice as long as the latter; thence becoming gradually smaller caudad and in branchial region reduced to a mere tubercle, but increasing in length again posteriorly. Neurocirrus coalesced with base of neuropodium, consisting of a stout, swollen cirrophore and a short, thick, cylindroid, imperfectly differentiated style; farther back the cirrophore merges more into the body outline and the style becomes more slender but is otherwise unaltered.

Gills simple, tapering filaments throughout. The first appears as a minute papilla on the notocirrus of XVI to XX, but they are usually not developed into efficient gills for several segments. At XXI or XXII they are usually as long as the notocirrus; in the middle region they reach the middle line and posteriorly gradually diminish in size and finally disappear about twenty segments anterior to the pygidium.

Acicula three to five anteriorly, simple, tapered, black, with pale tips little or not at all exposed. They become gradually longer, constantly three in number, conspicuous with prominently projecting bluntly-pointed tips which are always pale with black cores. Somewhere between XX and XXX and on following segments an especially large one diverges from the others and protrudes from the surface between the neurocirrus and the compound setæ.

Setæ all nearly or quite colorless, of three forms: two forms of simple setæ in supra-post-acicular fascicles and compound setæ in sub-pre-acicular fascicles. Compound setæ (Pl. VII, fig. 10) numerous, especially anteriorly where they occur in several rows anterior as well as ventral to the acicula; farther back they become fewer and are confined to the ventral group. The stems are gently curved and very little thickened distally; the appendages very uniformly of a length about four times the distal diameter of the stem with obscurely hooked bidentate tips and a finely fringed border separating at the tip into the usual guard. The fascicles of simple setæ consist chiefly of curved, capillary, slightly limbate or at least flattened setæ (Pl. VII, fig. 8) considerably longer than the compound setæ. Concealed among the bases of the latter on the acicular side of the fascicle is a group of very delicate gouge-shaped, pectinate setæ (Pl. VII, fig. 9), very few anteriorly, more numerous farther back and apparently all of one form.

Jaws of somewhat soft and flexible brown chitinous material, the teeth somewhat whitened and hardened by a calcareous deposit. Mandibles (Pl. VII, fig. 11) consisting of long, slender, strongly divergent carriers, firmly united anteriorly and bearing white, hard, calcareous, subovate distal plates with smooth and entire margins. Forceps jaws (Pl. VII, fig. 12) massive, with an undivided, shield-shaped base about three-fifths as wide as long, truncate distally, pointed behind; the forceps stout with strongly ridged but toothless bases and hooked tips flattened and angulated along the concavity. Second pair of maxillæ (II) also massive, the left one with three, the right with four stout teeth. Maxillæ (III) consist of a pair of crescentic plates bearing ridges with five teeth on the left, six on the right side; IV bears three or four stout teeth on the left side and a low edentulous ridge on the right side; V is represented on the left side only and is similar to the right IV.

Color in life unknown, but probably pale reddish like other species of the gems.

Known only from the vicinity of Monterey Bay; "big tide pool. June 20, 1905," E. C. Starks.

Marphysa californica sp. nov. (Plates VII and VIII, figs. 13-20).

This species is based upon the anterior ends of two specimens, one (type) very large, measuring 11 mm. wide and 80 mm. long for 92 segments, the other, consisting of 140 segments, 45 mm. long and 3 mm. wide. Both are much contracted.

Prostomium retracted beneath nuchal collar as far as base of tentacles, the exposed portion nearly as wide as long and consisting chiefly of the pair of broadly ovate frontal lobes divided by a median furrow that reaches nearly to the median tentacle, but with no trace of a ventral transverse furrow. Tentacles five, arising along a transverse curved line, median and outer pair subequal, the inner pair slightly longer and about equal to one and one-half times the width of the prostomium. They are longer and more slender than those of *M. stylobranchiata* and taper regularly to the end, being marked by irregular, more or less conspicuous transverse wrinkles for the entire length. Eyes one pair, inconspicuous and small, behind and external to the base of the inner paired tentacles.

Peristomium large, terete, swollen and furrowed laterally where it is more than three times as long as somite II, which is simple and apodous and about as long as the succeeding podous segments. No nuchal cirri. Remaining segments foot-bearing, the first five or six terete and narrow, after which they become wider and more depressed

but not longer, those of the anterior branchial region being ten to twelve times as wide as long, decidedly depressed and equally convex dorsally and ventrally. The smaller specimen is widest at about the posterior end of the anterior fourth and tapers thence caudad. Caudal end and pygidium unknown.

Parapodia begin on II at a low level and gradually rise to about XV, where they occupy about a middle level. First four small, the others of normal proportions and differing in no essential from those of *M. stylobranchiata*, although the postsetal lobe is relatively broader (that of IV is abnormally bifid).

Gills when fully developed pectinate, consisting of a short basal stem bearing from four to six slender, tapering, cross-wrinkled, crowded filaments not exceeding a length of one-fifth of the body width and none of which reaches the median line. On the type they begin at XXXIII on the left side with two filaments and at XXXIV on the right side with two filaments; three filaments occur on each side of XXXVI; for the next fifteen segments four is the usual number of filaments; between LV and LXV five is more frequent and thence to LXXXV or LXXXVI the maximum number of five or six or rarely even seven occurs; behind this to the end of the piece all gills are quinquefid. On the smaller specimen the gills begin farther forward and are much simpler. From XX or XXI to XXV they are simple, to XLIV and LI bifid, thence to about XC mostly trifid, then again bifid to CXXIV, and after that to the end of the piece they consist of a single filament.

Neuropodial acicula are simple, straight, tapered, blunt-pointed spikes, black or nearly black to the tips. On anterior parapodia there are four to six, with the tips little or not at all exposed and arranged in an oblique series between the two tufts of setæ. Farther back on middle segments there are only three much stouter acicula, the nearly black tips of which are conspicuously exposed. The cotype has only two of the spinelike acicula on middle parapodia and in addition a pale, more slender, bifid and hooded ventral crochet (Pl. VII, fig. 16), which is missing in all of the preparations made from the type.

Setæ generally more prolonged than those of *M. stylobranchiata*. Post-supra-acicular tuft very dense on anterior segments, consisting of numerous curved, tapering alimbate setæ (Pl. VII, fig. 13), the dorsal ones longer, more slender and colorless, the ventral shorter, stouter and yellow. On these segments the pectinate setæ are few and difficult to see and bear numerous fine teeth (Pl. VII, fig. 14a).

Farther back the slender setæ become fewer and the pectinate setæ of two forms, the one like those on anterior segments, the other (fig. 14b) with few coarse teeth. Compound setæ have the distal end of the stems somewhat coarsely toothed and the appendages very long, slender and tapered, with scarcely visible marginal denticulation (Pl. VII, fig. 15); more dorsal appendages are fully twice as long as the most ventral and all appendages become longer caudad.

Jaws deep brown, moderately hard but generally less massive than those of *M. stylobranchiata*. Mandibles (Pl. VII, figs. 17, 18) of two sides only slightly united, the carriers moderately divergent, long, regularly tapered and rather rough; calcified end-plates small, irregularly elliptical and coarsely toothed on the margin. Forceps jaws (Pl. VIII, figs. 19, 20) with carriers of incompletely united halves, quite as wide as long, broad and truncated at both ends and with a deep lateral notch about the middle of each side. The forceps have broad, strongly ridged hinge bases and edentulous masticatory plates, the distal part being comparatively slender and not strongly hooked. The second pair of maxillæ (II) are large and nearly symmetrical, each bearing four or five large, stout, hooked teeth. The next plate (III) is curved and much larger on the right, on which it bears seven or eight blunt conical teeth, than on the left side which bears six. In addition the right side bears a single small jaw, consisting of two thin plates meeting in a thickened ridge (IV). On the left side is a similar but smaller lateral jaw (V) and an internal curved plate bearing about six marginal teeth (IV).

Color anteriorly dull reddish purple marked with numerous small white spots, the cuticle with a greenish iridescence. Posteriorly the color is grayish with a pink tinge.

Type locality San Diego; E. C. Starks, collector.

ONUPHIDÆ.

Diopatra californica Moore.

Diopatra californica Moore, Proc. Acad. Nat. Sci. Phila., 1904, pp. 484-487; Pl. XXXVII, figs. 1-9.

San Diego, six specimens, including the type and cotype, taken in the tidal zone. Some of the gills are less elongated than in the type, and on one the spiral arrangement continues to about XXXIV. When perfect the tentacles taper to slender tips, the median reaching to XX, the inner pair to XVIII and the outer pair to XII. On one counted the last gill is on LVI.

LUMBRINERIDÆ.

Lumbrineris zonata Johnson.

Lumbriconereis zonata Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), pp. 408, 409; Pl. 9, figs. 93-100.

San Diego, several. Monterey Bay, numerous specimens taken at the following named points: "big tide pool," June 20, 1905; "point above Third Beach," July 12, 1904, and July 6, 1905; "Moss Beach," July 7, 1905; and "picnic tables, 17-mile drive," June 29, 1904.

This species is generally more slender than the next, the largest example reaching a diameter of only 3 mm. The cuticle frequently exhibits a beautiful greenish luster. Many of the specimens are brown or purplish-brown with darker spots on the prostomium, peristomium and on the sides of the setigerous segments; others are conspicuously annulated with dark brown bands and others nearly uniform in color. Those carefully studied have the setæ arranged in some of the anterior parapodia (V-XV) as follows: 3 or 4 large bilimbate dorsal setæ, 3 or 4 short hooded crochets in the middle and 3 small sigmoid bilimbate setæ below. The large maxillæ commonly bear four or five teeth. The caudal end tapers rapidly to a minute tubular pygidium bearing a pair of closely approximated, very short, thick, blunt cirri.

Lumbrineris erecta Moore

Lumbriconereis erecta Moore, Proc. Acad. Nat. Sci. Phila., 1904, pp. 490-492; Pl. XXXVII, figs. 19-22, Pl. XXXVIII, figs. 23-25.

Unlike the last this species appears to be most abundant at San Diego, where about forty specimens were taken in the littoral zone. At Monterey Bay several were taken at "big tide pool," June 20, 1905, and "Third Beach Point," July 6, 1905.

The largest measure nearly 7 mm. in diameter. The prostomium may be broad and obtuse or pointed. The posterior parapodia bear very long erect lobes which are the distinguishing feature of this species. The large maxillæ bear four teeth. Stalked infusoria are frequently attached in the furrows between the parapodia.

Drilonereis nuda sp. nov. (Plate VIII, figs. 21-23).

Excessively elongated and filamentous and of nearly uniform diameter. The three complete specimens in the collection are respectively 327, 445 (type) and 630 mm. long, with 480, 652 and 935 segments, the maximum width being 1.3 mm. and the depth 1 mm.

Prostomium strongly depressed, about one-third as deep as broad and nearly as broad as long in the type, but more extended in one cotype, broadly rounded in front, slight median grooves extending

for most of the length of both dorsal and ventral faces. No eyes or nuchal organs visible.

Peristomium a simple ring, strictly terete and about one-half as long as and slightly wider than the prostomium; its free ventral border forming a furrowed lip bounding the large mouth.

Somite II also achæitous, slightly smaller and more strongly convex laterally, in the latter respect resembling the setigerous segments. Body terete or with the venter slightly flattened, a little wider than deep and with a more or less evident longitudinal parapodial furrow along the sides. It is slightly enlarged in the middle and tapers gently both ways, the posterior end being more slender. Setigerous segments simple or when contracted faintly triannulate; anterior segments one-third as long as wide, middle and posterior often as long as wide. Pygidium a simple ring with vertical slit-like anus and no trace of cirri.

Parapodia (Pl. VIII, fig. 21) strictly lateral, minute, the posterior ones slightly larger but never exceeding one-third the length of their somites; all similar, consisting of a small rounded setigerous tubercle and a small postsetal lobe slightly flattened and bent dorsad.

Setæ few, varying from nine to eleven anteriorly and six or seven posteriorly; all pale yellow and of one form (Pl. VIII, fig. 22), somewhat geniculate, with the narrowly limbate end exhibiting a gentle sigmoid curve. In the bundles they tend to separate into a dorsal and a ventral group, the former including the somewhat larger number, or into three groups, the dorsalmost of which is formed of one, two or three setæ having somewhat more prolonged tips than the others. Anterior parapodia are supported by one or two stout acicula completely concealed within the body walls. At about XXV to XXX the aciculum (or acicula) reaches the surface and projects as a stout spine (or 2) ventral to the fascicle of setæ (fig. 21), a condition that continues to the caudal end. When two acicula are present one is usually stouter and is accompanied by a minute delicate seta, probably the tip of an undeveloped ordinary seta.

Jaws when at rest and retracted in somites VIII to X. Although the pharynx is lined throughout by a thick cuticle there is no trace of mandibles in the two specimens dissected. Maxillæ (Pl. VIII, fig. 23) black, dense and very hard; the forceps jaws (I) broad at base, stout, very strongly hooked at the end and lacking basal masticatory teeth; their paired filamentous carriers twice as long as the entire series of jaws and distinct nearly to the anterior end, where they unite into a small vertical plate bearing on its ventral margin an irregular horizontal plate with ragged tendons for muscular attachment. Second

pair of maxillæ (II) thick, triangular, curved plates bearing a thin internal accessory plate or wing, and about five marginal teeth on the left and seven on the right side, the most anterior in each case being strongly hooked and much the largest. The anterior pairs (III and IV) are small plates with one very acute, erect, claw-like tooth, III, having on the left side one and on the right side two additional small internal cusps. On the left side there is also a minute V bearing two small hooked teeth.

Color brown, each somite sometimes with two dark rings which may be concentrated in deep spots above the parapodia. Cuticle with a brilliant green iridescence.

The specimens were taken at a big tide pool near Monterey Bay, the type on July 6, 1905, and the cotypes on June 20, 1905.

STAURONEREIDÆ.

Stauronereis moniloceras sp. nov. (Plate VIII, figs. 24-29).

Form moderately slender, stoutest in pharyngeal region, thence tapering regularly caudad; anterior end broadly rounded, strongly arched above, flat below becoming rather more depressed posteriorly but the dorsum remaining rather strongly arched. Maximum length recorded 69 mm., width in pharyngeal region 3 mm.; number of segments up to 110.

Prostomium subglobose, not annulated, broadly shield-shaped in outline, slightly longer than broad, slightly contracted toward the posterior border which bears a small, median, rounded lobe united with the median peristomial lobe. Ventrally a pair of conspicuous palpal ridges separated by a deep cleft pass from the prostomium into the mouth and terminate in pointed processes within the buccal chamber. Dorsal tentacles arise from sides of prostomium just behind the middle, are about one and one-half times as long as prostomium, slightly curved and divided into about seven (6-8) short joints. Very conspicuous palps arise from beneath the tentacles from enlarged bases continuous with the palpal ridges and curve boldly back round the sides of the mouth; they are about one and one-half times as long as the tentacles, rather strongly flattened proximally and undivided except for a few transverse furrows along the concave side. Eyes two pairs, black, conspicuous, rounded, the posterior dorsal and close to the posterior border, the anterior dorso-lateral and just anterior to base of tentacles.

Peristomium enlarged and swollen, three times as wide as prostomium, nearly twice as wide as long and about as long as three succeed-

ing segments, uniannular, strongly convex and elevated above and divided anteriorly into three lobes: a median united with the median prostomial lobe and a prominent lateral pair which embraces the sides of the prostomium as far forward as the tentacles. Nuchal organs between these lobes and the prostomium, deep, quadrate, with furrows passing from the angles. Mouth large with deeply furrowed lips, cutting the peristomium nearly to its caudal border.

Somite II a simple apodous ring one-third as long as the prostomium. Succeeding segments podous, but otherwise similar to II. Anteriorly they are one-eighth to one-sixth as long as wide, but become one-fourth to one-third as wide in the middle and posterior region. All perfectly simple with rounded, bulging sides and separated by deep furrows; a projection below each parapodium, combined with the flattened venter, produces an almost sole-like surface.

Pygidium an oblique ring with anus directed obliquely dorsad and surrounded by a low welt. Caudal cirri two pairs, behind anus; the more dorsal cylindrical, longer, about equaling diameter of pygidium and formed of four or five articulations; the more ventral about one-half as long, clavate and formed of two articulations.

Parapodia arise from a slight depression close to the ventral level of the segments and project prominently directly laterad to a distance of more than one-half width of body. They are uniramous, consisting of a prominent neuropodium, compressed and somewhat expanded distally where it is divided into a broad rounded postsetal lobe, a shorter presetal lobe subdivided into two small secondary lobes and a small subsetal lobe. In different regions the form of these lobes varies somewhat and especially they become more pointed posteriorly. Neurocirri arise from basal half of venter of neuropodium, and as a simple conical or subcylindrical process reach nearly as far as its end. Notocirri arise in contact with dorsal base of neuropodium and consist of a long cylindrical cirrophore ciliated on its ventral side, probably representing the notopodium, as it contains a slender aciculum or rarely two acicula, and reaching beyond the end of the neuropodium except on anterior segments; at its end it bears a conical style about one-third its length. The first parapodium (on III) differs from all of the others in its very small size, greater simplicity (being entire distally), in its short, rounded neurocirrus and especially in the total absence of a notocirrus.

Neuropodial aciculum always single, moderately stout, tapered, straight, with a simple blunt point. Notopodial acicula, one, or

rarely two, very slender, almost fibre-like, tapered and reaching nearly to tip of cirrophore. All acicula pale yellow.

Setæ perfectly colorless and vitreous, of two kinds: simple supra-acicular and compound subacicular. The former (Pl. VIII, fig. 25) number 15–20 on anterior parapodia, and become gradually fewer and stouter posteriorly until they are reduced to a single rather stout one. They are gently curved, slightly tapered and faintly fringed along the convex side, and terminate rather abruptly in a small blunt hook which is embraced between a pair of guards difficult to observe on the more slender setæ, but sufficiently obvious on most of the stouter ones. Compound setæ form an oblique spreading tuft of twenty to thirty on anterior and about one-half as many or even fewer on posterior segments. The stems (fig. 24) are gently curved, slightly enlarged and obliquely truncate distally, and just perceptibly denticulated on the convexity. Appendages subtriangular, their length two or three times the distal width of the shaft, tapered to the prominently hooked tip, below which is a conspicuous accessory tooth, the whole protected on one side by a very delicate, minutely denticulated guard.

The jaws of only one specimen were dissected. The smallest ones are deep brown, the others black and opaque. Mandibles (fig. 26) are heavy, with forcep-shaped bases and massive end-plates, the convex margins and ends of which bear a series of blunt teeth and are much broken with use; a thin chitinous streamer containing two or three black nodules is appended to the lateral side of the tip and the two plates are lightly jointed medially. Maxillæ form two long bands extending through about eight segments and borne on the dorsal face of a thick muscular pad. They are slightly united behind and each consists of three series of denticles of about thirty-five or forty each, besides a posterior tract where the separate denticles of each series have coalesced. All free denticles have more or less deeply cleft V-shaped bases, and those at the anterior end of each series are most complex, hooked and slender. The inner series consists of small denticles (figs. 29*a* and *b*), the anterior members of which have a pair of long, subequal, acute teeth often flanked by smaller ones; passing caudad the lateral teeth disappear and then one of the large teeth, leaving a series of one-toothed plates that soon unite into a serrated band. Jaws of the outer and middle series are much larger; the outer ones (fig. 27) with strongly curved stems and several acute teeth arranged asymmetrically near the end; several of the most anterior are very slender, strongly falcate and nearly simple, but they soon

become more complex and then more massive, with the lateral teeth shorter and less distinct; finally they coalesce into a flexible band. Those of the middle series (fig. 28) are generally similar to the outer, but tend toward greater symmetry and undergo similar changes caudally, where they tend to unite with the jaws of the outer series as well as with one another. Sometimes the outer series is partly deficient.

The type is a female filled with large eggs and of a generally pale color tinged with rich rusty yellow anteriorly.

It was taken at Monterey Bay on June 20, 1905, by Mr. E. C. Starks. Additional specimens were collected at the point above Third Beach, vicinity of Monterey Bay, on July 12, 1904.

This species resembles *Anisoceras vittata* Grube and Oersted somewhat closely, and more complete information regarding the latter, which was taken at Punta Arenas, Costa Rica, may establish their identity. It is, however, much larger than Oersted's specimens and differs from Grube's description in several other respects.

GLYCERIDÆ.

Glycera nana Johnson.

Glycera nana Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), p. 411, Pl. 10, figs. 103, 103a.

Seven specimens, one of large size, were taken at San Diego.

Glycera rugosa Johnson.

Glycera rugosa Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), pp. 409-411; Pl. 10, figs. 101, 102.

San Diego, six specimens. Some of these have the branched gills extended on nearly every parapodium; on one they reach far beyond the parapodial lobes; others have all or nearly all retracted.

Hemipodia borealis Johnson.

Hemipodia borealis Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), pp. 411, 412; Pl. 10, figs. 104, 104a.

San Diego, four specimens; Monterey Bay, one at point above Third Beach, July 12, 1904.

An example 60 mm. long and 2.5 mm. in maximum width (exclusive of the parapodia) in the anterior fourth tapers regularly to the caudal end, and has 141 strongly biannulate segments which become relatively longer caudad where the larger podous annulus may be again divided.

The "head" consists of a wider basal two-fifths or more, consisting of at least two segments bearing minute setigerous parapodia, the peristomium and a portion of the prostomium. It includes the mouth, which is bounded laterally by a pair of large, low pads. The anterior

part is a short, somewhat depressed, rapidly tapered cone obscurely divided into about eight rings and bearing at the apex two pairs of small but distinct, slender, divergent tentacles.

The parapodia agree with Johnson's figures; anteriorly they are small, but gradually increase in length until the posterior ones become quite prominent and slender.

ARICIIDÆ.

Aricia johnsoni sp. nov. (Plate VIII, figs. 30-33).

The solitary specimen upon which the following description is based lacks perhaps about 100 caudal segments, the remaining 182 segments measuring 72 mm., and in the widest part of the anterior region is 3 mm. wide and 1.8 mm. deep.

Prostomium small, acutely conical, about twice as long as the basal width, bearing at the apex a minute cirriform palpode, the base slightly swollen and on the dorsal surface exhibiting an obscure transverse row of minute specks, probably eye-spots.

Peristomium a truncated cone nearly as long as the peristomium and two to two and one-half times as broad; on its venter is a quadrate, cushion-like area, behind which the minute mouth lies between it and somite II.

Anterior region of body strongly depressed, elliptical in section and scarcely two-thirds as deep as wide, increasing in width rapidly to X, then more gradually to the widest point at XVIII or XIX, following which is a rather marked constriction extending over about ten segments (those bearing the pectinated ventral folds). The entire posterior region is very strongly convex below, flattened above, and bears the parapodial lobes, setæ and gills in a dense brush-like arrangement. Intersegmental furrows well marked; segments of anterior region one-third to one-fifth as long as broad, obscurely biannulate owing to a slight welt and groove encircling them opposite the parapodia; segments following region of ventral pectinations simple and much shorter. Pygidium unknown.

The ventral half of the welts alluded to above is better developed than the dorsal half and bears the pectinated folds which are incipient, as two or three small slender papillæ, on each side of the neural line of XXI and XXII. On XXIII they reach from the neuropodium to the middle line, consisting of five or six closely contiguous smaller papillæ at the dorsal end and two or three larger detached papillæ at the ventral end. On succeeding somites the number of papillæ increases to fifteen or sixteen on each side, all but the two or three ven-

tralmost being in a close transverse series beginning immediately beneath the neuropodia. On XXIX the papillæ become fewer and less crowded and the next three segments bear only two or three detached papillæ on each side immediately beneath the neuropodia, the median area being bare.

Parapodia of the anterior region are lateral and consist of low sloping neuropodial platforms, bearing palisades of four to six rows of setæ backed by a low postsetal fold. In the neighborhood of XV, where they are largest, they are about twice as deep as long, but anteriorly the depth diminishes until it scarcely exceeds the length, while behind XV they gradually decrease in both length and depth and in the pectinated region shift dorsad to assume the form characteristic of the posterior region at about XXII. Notopodia of anterior region inconspicuous spreading tufts of sessile setæ immediately dorsad of the neuropodia. When fully changed, beginning at XXIV, the parapodia of the posterior region are strictly dorsal, borne with the gills on a transverse fold. Each ramus consists of an elevated setigerous tubercle bearing a small erect tuft of slender capillary setæ and, in the case of the neuropodium, a postsetal lobe divided into a minute conical ventral part connected by a membrane to the side of the segment, and a larger somewhat foliaceous dorsal part, while the postsetal lobe of the notopodium is slightly foliaceous, sublanceolate and abruptly bent at the base where it embraces the setæ tuft. The only change caudad is an increasing prominence for a time of the parapodia and a progressive increase in length and slenderness of the notopodial postsetal lobes.

Gills begin on XX as a pair of minute papillæ situated on the dorsum and well separated from the notopodia. They increase in length gradually and are fully developed only on segments following the pectinated region, where they increase correspondingly to the growth of the parapodia, but always rise above the notopodial lobes as erect, slightly flattened, lanceolate and ciliated processes close to the median line and united with the opposite member of the pair by a low membrane.

No color remaining. Proboscis unknown.

Notopodial setæ of anterior region in spreading tufts, rather short, tapered, flexible, capillary, with conspicuous subannular cameration and along one side a small oblique opening into each chamber (Pl. VIII, fig. 32). In the posterior region they are straighter, much longer, more slender and erect, and associated with the capillary setæ in the ventral part of middle and posterior bundles are a few very delicate

bifurcate setæ of peculiar form (fig. 33). They have the slender stem with half-round collar flanges which appear in profile as marginal serrations; the end of each prong is expanded and slightly bilobed and provided along the inner side with long oblique hairs. Anterior neuropodials form dense palisades of four to six series of chiefly short, blunt, somewhat clavate, yellow spines, bent near the end and marked with transverse serrullæ at the convexity and with the tips enclosed in a sheath (fig. 30). Those of the most caudal series of each palisade are more slender and bear a slender, tapered, smooth tip; and at the ventral border of each is a small tuft of setæ like the notopodials but smaller. Neuropodial fascicles of the posterior region are small, compact, erect and consist of a few very slender, straight setæ (fig. 31) with minute appressed teeth along one side. Setæ all colorless.

This species was taken at Moss Beach, near Monterey, Cal., on July 7, 1905. It is probably the species mentioned as occurring commonly on the California coast by Dr. H. P. Johnson, our leading authority on the Polychæta of that region, to whom it is a pleasure to dedicate it. The type is a female filled with large eggs.

Naineris robusta sp. nov. (Plate VIII, figs. 34-37).

Form generally similar to *N. longa* but decidedly stouter, tapered both ways from the middle, the anterior end more depressed and broadly rounded into the prostomium, the posterior region subterete, strongly convex below, flattened above. The largest specimen is 170 mm. long and has a maximum diameter in the middle of the body of 4 mm.; from 26 to 30 segments constitute the anterior region and as many as 360 the posterior region.

Prostomium broad, flat, somewhat shovel-shaped, broadly rounded and with a thin margin anteriorly; posteriorly somewhat narrower and retracted within the peristomium; ventrally it is continued by a somewhat swollen rugous area to the mouth and is united to the anterior peristomial ring. No eyes; deep lateral recesses at the peristomial furrow represent the nuchal organs.

Peristomium a somewhat indistinct naked ring about equaling II, simple above, below split into two rings between the rugous folds of which the mouth lies.

Segments of anterior region about eight times as wide as long, convex below, slightly concave above and about half as deep as wide. Passing into the posterior region the segments become shorter (about 12 times as wide as long), much deeper, very convex below and nearly flat above. No sharp boundary exists between the two regions, but estimated by the segment upon which conspicuous neuropodial setæ cease twenty-eight may be counted in the anterior region.

Pygidium a short tube with large terminal anus surrounded by a membrane bearing a circle of minute papillæ and a small but distinct pair of ventral cirri knobbed at the ends.

Parapodia begin on II. When fully developed at about X the neuropodia consist of low fleshy projections at the extreme dorsal level of the sides; they bear a scarcely evident presetal lobe and a more prominent thick postsetal lobe which rises above into a free process especially evident on the more restricted neuropodia of anterior and posterior segments. Setæ are of a deep brown color and form a conspicuous palisade of five or sometimes six vertical series arranged in an elliptical area three times as deep (dorso-ventrally) as long (antero-posteriorly) on middle segments, but less deep anteriorly and posteriorly. In the posterior region neuropodia become reduced to small pointed processes situated ventro-laterad of the notopodia, with which they are united by an integumental fold; they bear a tuft of inconspicuous setæ. Notopodia of anterior region dorsal, separated from the neuropodia by a short interval and consisting of a short setigerous tubercle and a small but prominent postsetal lobe thickened along the lateral border and rising mesially into a pointed process; they bear small spreading tufts of setæ of various lengths, the longest directed mesially. Except that they become more elevated, the postsetal lobes erect and sublanceolate in form and the setæ reduced to small vertical fascicles, the notopodia are little changed in the posterior region.

Branchiæ appear at from VII to X as slender and inconspicuous processes as long as the segment and arising from the dorsum just mediad of the notopodia. No marked change is undergone until, passing into the posterior region at about XXIX, they abruptly become much longer, flattened and lanceolate, densely ciliated on both borders and united to the notopodia by a membranous fold. They completely fill the dorsal field between the notopodia and generally extend mediad until they touch and bend sharply dorsad. They continue to the posterior end.

No clear distinction between acicula and setæ exists, but some of the latter reach deeply into the body walls and serve for muscular attachment. On typical anterior neuropodia the stout, brown setæ form a conspicuous palisade of five (or rarely six) vertical rows which bend backward and successively overlap. Those of the posterior series (Pl. VIII, fig. 34) are stouter than the others, with short, blunt roughened tips; the others (fig. 35) are abruptly contracted immediately beyond the surface of the body and taper into long, acute tips

finely denticulated along one margin. There is also a small ventral group, arranged in a few obliquely longitudinal rows, of slender capillary setæ denticulated and camerated like the notopodials. Anteriorly these capillary setæ increase in number, the tips of the stouter setæ lengthen and the rows become shorter, although remaining five. Posteriorly the length of the rows again decreases and at about XXX their number is abruptly reduced from five to three and the stout setæ quickly disappear, leaving only the ventral capillary setæ. These are colorless and exactly like the notopodials of the same region, except that they are somewhat shorter and the fascicles more spreading. They undergo little change throughout the posterior region, but on middle and posterior segments six or eight small blunt spines appear among their bases and probably represent the projecting ends of acicula. Except that the tufts are larger and more spreading in the anterior and more erect in the posterior region the capillary notopodial setæ do not differ. They are colorless, slender with much attenuated tips, slightly curved and the distal half asymmetrically camerated and finely denticulated along the convexity (fig. 36). A very small number of bifurcate setæ (fig. 37) are associated with the capillary setæ in the ventral part of the bundle, but they are difficult to see and appear to be absent from the anterior and many segments of the posterior region.

The protruded proboscis has the form of a rosette with ruffled margins, the deepest folds dividing it into four lobes, each of which is again subdivided into two, three or four much folded lobules.

Color pale brown with neural and infrapodal series of spots, or more extensively pigmented with dark brown.

The type and two other examples, the former being an egg-bearing female, were taken between tides at San Diego, and a single specimen at Monterey Bay on June 20, 1905.

Naineris longa sp. nov. (Plate VIII, figs. 38-42).

Form moderately slender; the anterior region slightly wider and obscurely separated from the posterior by a slight constriction, rather strongly depressed, flattened above; posterior region gently tapered caudad, strongly convex below, flat above. Length up to 140 mm., of which the anterior region is 16 mm.; width and depth at caudal end of anterior region respectively 3 mm. and 2.5 mm. Number of segments of full-grown worms 290 to 310, of which 22 to 26 belong to the anterior region.

Prostomium broad, flat, about twice as wide as long; anterior border gently convex and slightly upturned; ventral surface extended some-

what backwards to the mouth as a slightly rugous area; a few spots of pigment but no distinct eyes on the dorsum. On each side at the junction of prostomium and peristomium is a deep nuchal pit.

Peristomium a distinct achætous ring, longer than either prostomium or somite II, simple and entire dorsally, but ventrally divided nearly or quite to its posterior border by the large subtriangular mouth, a small median process of II projecting slightly into the incision.

Two regions of the body not sharply defined, distinguished chiefly by differences in character of the notopodia and degree of development of the gills. Segments of anterior region depressed, convex below and flat above, distinct and sharply defined by well-marked but not especially deep furrows, uniannular marked by a slight transverse ridge ventrally and by a pair of faint impressed paramedian longitudinal lines dorsally. Segments of posterior region short, at first much crowded but farther back much less so, similar to those of anterior region, but lacking the dorsal impressed lines and much more strongly convex below. Caudal end depressed and broadly rounded, ending in a short tubular pygidium with large anus directed slightly upward and surrounded by a circle of papillæ and a pair of minute ventral cirri.

Parapodia biramous, beginning on II and situated at a high level. Neuropodia of anterior segments small, rather fleshy, elliptical sloping prominences about as deep dorso-ventrally as long antero-posteriorly, and produced into small rounded postsetal lobes which on more posterior segments tend to be prolonged dorsad. They are largest on the middle segments of the region and the three rows of stout setæ that they bear are here stoutest. Notopodia separated from neuropodia by a deep groove and consisting of small tubercles bearing a slender tuft of capillary setæ, behind and below which is a subconical, erect postsetal lobe most prominent on anterior somites, and when best developed bearing a convex wing on the ventral side of its base. On posterior segments of this region the neuropodia become smaller and shifted dorsad and the rami crowded. On the posterior region both rami are borne on the dorsum and so closely approximated that they seem almost to have a common somewhat elevated base. Both rami are foliaceous, the neuropodium small and somewhat mammilliform bearing its setæ in a fan-shaped fascicle; the notopodium consisting of an erect, sub-lanceolate postsetal lobe and bearing a small compact tuft of setæ.

Gills begin on from X to XII as slender, erect, conical processes on the dorsum immediately above the notopodia. They undergo little

change to the last two or three segments of the anterior region, where they rather abruptly become longer and thicker. On anterior segments of the second region they extend transversely across the dorsum from the notopodia and meet medially, but though continuing to the posterior end they become gradually smaller. Each includes a single vascular loop, and is heavily ciliated along the medial margin.

Notopodial capillary setæ (Pl. VIII, fig. 40) appear to be similar throughout—soft, slender, tapered, regularly and closely provided with obscure, incomplete sheaths, corresponding to slight internal camera-tion. The fascicles are slightly more spreading anteriorly, more compact and erect posteriorly. At the base of the notopodials on the ventral side of the tuft are three or four small and delicate bifurcate setæ (fig. 42) with serrated stems and slender tapered prongs bearing a series of long oblique hairs. Neuropodials of the posterior region are mostly similar to the notopodials, but the sculptured region is shorter, and in addition there is a ventral series of about six small smooth blunt spines (fig. 41). Anterior neuropodials are arranged in three nearly vertical series, the first extending most ventral. All are stout, but those of the anterior two rows (fig. 39) bear slender terminal portions similar in structure to the notopodial setæ but much more abruptly tapered; those of the posterior series are stout, curved, smooth, clavate spines (fig. 38). Ventral to the palisade is a crescentic series of smaller capillary setæ. All of these setæ are stoutest in the middle and posterior parapodia of the anterior region, but on the last few transition segments rapidly become more slender and the series short and restricted from the ventral end. Or it may be said that the three series of stout spinous setæ gradually disappear, finally leaving only the ventral group of slender setæ with a few small spines.

Proboscis partially protruded on several specimens. It appears to consist of four principal divisions, each again bilobate and bearing from four to ten slender elongated processes with a continuous hem-like raised border, leaving a longitudinal groove on each. The lobes are often irregular and unequal and some specimens appear to have the proboscis divided into from five to eight fimbriated lobes.

Color in alcohol dull creamy yellow, more or less marked with brown pigment which is most constant as three series of ventral spots, a subneural and paired infra-podal. Others have the gills or parapodia pigmented and others the dorsum marked with suffused spots or well-defined annulations, while extreme forms may be deep chocolate brown.

This species appears to be quite plentiful between tides in the

vicinity of Monterey Bay and was taken at Third Beach Point (which is the type locality) on July 6, and at "big tide pool" on June 20. A single example also occurs in the Starks collection from San Diego, also taken between tides.

CIRRATULIDÆ.

Cirratulus spirabranchnus Moore.

Cirratulus spirabranchnus Moore, Proc. Acad. Nat. Sci. Phila., 1904, pp. 492, 493; Pl. XXXVIII, figs. 26 and 27.

Cirratulus luxuriosus Moore.

Cirratulus luxuriosus Moore, Id., pp. 493, 494; Pl. XXXVIII, figs. 28-31.

Both of these species are quite plentiful between tides on the beach at San Diego.

Tharyx multifilis sp. nov. (Plate IX, fig. 43).

The type (a male) is 58 mm. long and has a maximum diameter at the end of the anterior third of 2.1 mm. The segments number 240. A female is slightly smaller and more slender.

Prostomium (fig. 43) a short slightly depressed cone with a rather deep ventral longitudinal groove and just anterior to it a transverse one. No eyes visible, though there is a slight discoloration near the posterior border. A pair of swellings behind and above mouth are the nuchal organs, but there is no trace of appendages.

Peristomium—probably representing three coalesced segments—a large, swollen, apodous region about twice as wide and long as the prostomium and marked with one or two partial furrows. Mouth large, with smooth lips.

Remaining segments setigerous, the anterior region about six millimeters long, consisting of about sixty excessively short segments, twelve to twenty times as wide as long, depressed and somewhat widened. Behind this the body is nearly terete, slightly flattened below and composed of longer, feebly separated segments about six to eight times as long as wide. Segments all perfectly simple and uniannular. The body increases in diameter through the anterior third and then tapers gradually to the caudal end, terminated by a minute pygidium with its central anus surrounded by a welt-like rim. A narrow neural groove extends for the entire length and forks at the peristomium to embrace the mouth.

Parapodia consisting of minute setigerous notopodial and neuropodial tubercles, the latter situated close to the ventral surface at the foot of the strongly arched dorsum. Immediately above the first arises the pair of large clavate tentacular cirri, which have a diameter nearly

equal to the length of the prostomium and a length of nearly one-third the body, grooved and crenulated for the entire length, narrow at the base and becoming gradually thicker toward the distal end. One specimen bears a pair of minute branchiæ on this segment; on the other they begin on the following segments. The branchiæ are very delicate extensile vascular filaments, which in all cases arise in actual contact with the dorsal side of the notopodium. In perfect specimens they probably occur on every segment except about twenty at the caudal end, but in both of the two here described they are small or absent on many of the middle ones. In the anterior depressed region they are more firmly attached and longer than elsewhere, occur regularly on every segment and form a crowded tangled mass.

Setæ perfectly simple, colorless, smooth, slender capillaries, forming small, spreading, fan-shaped notopodial and neuropodial tufts; except that the notopodials are longer than the neuropodials and the anterior longer than the posterior they are all exactly alike, the longest equaling one-half the body diameter.

Color of male pale brownish, of female deep slate color.

Since the type of the genus *Heterocirrus* has been shown to be an epitokous phase of *Dodecaceria*, the next available name for such forms as *Heterocirris multibranchis* and the present species is *Tharyx* Webster and Benedict.

Dodecaceria pacifica (Fewkes) (Plate IX, fig. 44).

Sabella pacifica Fewkes, Bull. Essex Inst., XXI (1889), pp. 132, 133; Pl. VII, figs. 1, 2.

More than a score of well-preserved examples of this species permit of the preparation of a description more complete than the original.

Usual length 30 to 40 mm., but sometimes extended to nearly twice that length; maximum diameter about 1 mm.; number of segments from 90 to 110.

Body generally terete, usually slightly enlarged in the middle and tapered a little each way, but often depressed and distinctly widened at the posterior end; irregular enlargements and constrictions often present at one or two other points. When depressed the venter is flat, the dorsum convex.

Prostomium and peristomium completely coalesced, together forming a subconical head about one and one-half times as long as wide, entirely without definite appendages, but with a pair of small dorsal spots which probably represent the nuchal organs. The anterior half, representing the prostomium, is a somewhat scoop-like, broadly rounded lip deeply excavated below and overhanging the mouth,

from the sides of which project a pair of small lobes probably representing palpi; these lobes and the ventral surface of the lip are pale, in sharp contrast to the nearly black surface of the remainder of the head. The posterior or peristomial half is a simple naked ring.

Several of the immediately succeeding metastomial segments are very short, but those following become gradually longer until they are one-fourth or one-third as long as wide, but caudally they again become very short and crowded and end in a simple pygidium with rather large central anus.

The first metastomial segment (II) bears a dorsal pair of simple terete branchial filaments or notocirri which in extension are smooth and three or four times as long as the head and in contraction transversely wrinkled and much shorter; ventral to these is a pair of usually shorter and thicker neurocirri or prehensile tentacles which are grooved along the ventral face and transversely wrinkled. The latter vary much in length in different specimens, being in some less than the diameter of the body, in others more than three times the diameter. Notocirral branchiæ also occur on from seven to ten next succeeding segments (III to IX or XII). Of these the first three are commonly larger than that on II, and because of the dorsal position of the latter and the extreme shortness of the segments lie at successively lower levels in a nearly vertical series; the fifth and succeeding pairs arise immediately dorsal to the notopodial setæ and on the same level as the fourth pair. Specimens from the vicinity of Monterey Bay have the fifth and rarely the sixth pair nearly as long as the more anterior, but on those from San Diego they are always much shorter like the remaining more caudal pairs, the last of which are usually mere rudiments.

Parapodia very small, lateral notopodial and ventro-lateral neuropodial tubercles separated by a small interval. Small tufts of notopodial and neuropodial setæ begin on II. On from eight to eleven segments they are all slender, finely serrate setæ, most numerous and longest in the notopodia, in which they may be as long as their segment or longer. At from IX to XII two stout yellow spines, bifid and hooked at the end, appear in the neuropodium and a few segments caudad similar ones in the notopodium. They may be accompanied by and alternate with two or three minute capillary setæ, but by about XX and all through the middle region spines alone are present, from two to four occurring in each fascicle and the neuropodial (Pl. IX, fig. 44) being decidedly stouter with the terminal prong slightly hooked, flattened and excavated. Notopodials straighter, less hooked and more flat-

tened distally. In the posterior fourth the spines of both fascicles become less stout, straighter and associated with capillary setæ which gradually increase in length and finally displace the spines altogether.

In the preserved state these worms are perfectly opaque and of a deep sooty black or sometimes a bluish black, especially deep and uniform in the San Diego examples, but some of them become more or less brown in the middle or anterior regions. Ventral face of prostomium, groove of prehensile neurocirri and bases of branchial notocirri pale.

About fifteen examples were taken at Third Beach Point, vicinity of Monterey Bay, on July 6, 1905, and about thirty at San Diego. Most of these are mature and contain nearly ripe ova or sperm balls.

TEREBELLIDÆ.

Terebella californica Moore.

Terebella (Schmardanella) californica Moore, Proc. Acad. Nat. Sci. Phila., 1904, pp. 496-498; Pl. XXXVIII, figs. 36, 37.

This species is quite plentiful at San Diego, living in burrows in the beach at low water. Including the lot upon which the original description was based, about thirty specimens occur in the collection. Several are packed full of eggs and some of them are much longer than the type, reaching 130 mm. The number of setigerous segments varies from 25 to 28.

Amphitrite robusta Johnson.

Amphitrite robusta Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), pp. 425, 426; Pl. 16, figs. 164-168.

A single example taken at San Diego is a female stuffed with eggs. It is about 105 mm. long, the first eleven thoracic segments being 11 mm. long and equal to the greatest width of the thorax.

Lanice heterobranchia Johnson.

Lanice heterobranchia Johnson, Proc. Bos. Soc. Nat. Hist. XXIX (1901), pp. 427; Pl. 17, figs. 172-174.

San Diego. A single small macerated *Lanice* probably represents this species, with the description of which it is in accord, except that the terminal twigs of the branchiæ are fewer.

Pista elongata sp. nov. (Plate IX, figs. 45-47).

Form rather slender and elongated, clavate, the somewhat thickened thorax followed by a constriction in the anterior abdominal region; posteriorly gently tapered to the pygidium. Length 160-192 mm., of which the thorax is 25-28 mm.; diameter of thorax 5 mm. Number of segments 176-240, 20 belonging to the thorax.

Prostomium a prominent, stiff, broad and simply arched upper lip,

behind which is the broad, tumid crescentic tentacular ridge, bearing the very numerous tentacles in about eight transverse rows.

Peristomium very short and obscure dorsally; ventrally prolonged into a prominent scoop-like fold bearing a tumid lower lip and produced laterally into a pair of rather prominent, broadly rounded wings. Next three segments short, somewhat depressed, and branchiferous. A pair of prominent, rounded, lateral wings arise at a level somewhat more dorsal than those on the peristomium and conceal the greater part of the sides of II. Remaining thoracic somites are much longer and subterete, 3 or 4 annulate, with prominent, glandular parapodial areas and the dorsal and ventral fields much transversely wrinkled. Ventral gland plates on II to XIII inclusive, but all rather inconspicuous and the first especially small. Abdominal segments very numerous, flattened and muscular below, arched and thin-walled above. Pygidium annular with a brownish thickened rim bearing a circle of about sixteen small, equal papillæ surrounding the large anus.

Gills three pairs, on II, III and IV; except in one case all present and well developed, symmetrical, usually decreasing in size from before caudad, those of the middle pair arising at a slightly lower level than the others. Owing to their great contractility they differ much in form and appearance, but are strictly aborescent and more or less open according to the degree of contraction. When fully extended the stem is a smooth, tapering column having a length equaling or exceeding the thoracic diameter and bearing at the summit four or five main branches, each of which again divides about six times and terminates in slender tapered filaments. The plan of division is dichotomous but irregularities are numerous, and although the trunk cannot be traced through the crown, one branch of a pair is usually larger than the other and frequently a single long tapering filament occurs opposite the point of origin of a branch of any order. When contracted the branches appear short and cylindrical, with the filaments in crowded terminal tufts. The latter are readily detached and regenerated.

Setigerous tubercles begin on IV and continue for seventeen segments or to XX. They are large, prominent, well separated from the tori, somewhat flattened and bear broad fascicles of setæ. The first pair (on IV) are smaller, and small papilliform cirri occur behind the setigerous tubercles of VI to X inclusive. Uncinigerous tori well marked and regular, retractile ridges separated from the setigerous tubercles by an interval exceeding the diameter of the latter.

The first six (V-X) with uncini in one row and having a length of about twice the segment bearing them, the others with uncini in two interlocking series and at first abruptly much longer, but the caudal three or four again shorter and shifting on to the venter behind the ventral plates. Abdominal tori small but prominent, latero-ventral lappets bearing a single series of uncini sunken below a raised border and terminating dorsally in a short cirrus-like projection.

Setæ pale yellow, numerous, arranged in two ranks in broad fascicles, those of one rank shorter, but all rather long, tapered, acute, bilimbate with rather broad but not extensive margins and entire, unfringed tips.

Uncini deep yellow on thorax, paler on abdomen. On first six thoracic and all abdominal tori in a single series pointing forward, on XI to XX in double interlocking series. About 40 on V to VII, 50 on VIII-X, 80-85 on XI to XV and 50-60 on XVI to XX. Anterior abdominal tori bear about 70 uncini. On somites V, VI and VII they are large, with long tapered handle-like bases (Pl. IX, fig. 45) and a prominent anterior projection for muscular attachment; the beak is long and nearly straight, the crest composed of a single transverse series of large teeth and the guard large. These characters are most pronounced on V and gradually decline on VI and VII. On VIII to X the uncini are transitional to the typical form (Pl. IX, fig. 46), which on the posterior thoracic somites has the manubrium much reduced and chiefly replaced by a thin, translucent, ligamentous expansion, the base short and triangular, the beak strongly hooked, short and stout and the crest more elevated and composed of about three transverse series of teeth of diminishing size. Abdominal uncini (Pl. IX, fig. 47) still smaller with reduced convex bodies, acute, strongly hooked beak, high crest composed of numerous teeth and long filamentous anterior and posterior ligaments.

Color in alcohol uniform dark brown.

This species is founded on four specimens taken between tides at San Diego by E. C. Starks. It differs from the Alaskan species provisionally referred to *P. fasciata* in the much greater length and more numerous abdominal segments, in the smaller lateral wings, the absence of a post-branchial fold and especially in the form of the branchiæ. It is closely related to the Japanese species *P. maculata* Marenzeller which has a similarly elongated body, three pairs of similarly branched gills and uncini of similar form. The principal distinctions are that the latter has larger and more numerous ventral plates and no distinct second pair of lateral wings.

Pista (Scionopsis) alata sp. nov. (Plate IX, figs. 48-51).

Form moderately stout, widest and somewhat depressed anteriorly, tapered regularly to caudal end. Length of type 63 mm., maximum width at X 9 mm. Number of segments 94, in addition to a few scarcely differentiated ones at the caudal end.

Prostomium rather small but prominent, thickened, arched, its sides continued ventrad to nearly enclose the mouth, below which they end in a pair of short, thick lobes each bounded laterally by a slight indentation. Tentaculiferous ridge low and thick, bearing numerous tentacles arranged in a single transverse row in the medial and in two transverse rows in the lateral part. Tentacles numerous, rather short and thick, very slightly attached by a contracted base and deeply grooved or folded for most of their length. Many of the dorsalmost ones are short and imperfectly developed.

Peristomium and two or three immediately following segments short, contracted and terete. Peristomium produced into a prominent ventral fold with a deep median emargination, on each side of which it spreads laterally as a great flaring wing reaching dorsally to the level of the setigerous tubercles. Somites II and III are distinct dorsally and ventrally but confounded laterally. The anterior margin of the former is produced on the ventral surface as a slight fold. Beginning at the sides of the ventral plate of III is a pair of conspicuous wings which extend obliquely up the sides of III and the anterior margin of IV and which are united across the dorsum of the latter by a transverse fold bearing a prominent median forward projection.

Posterior to the branchial region the thoracic segments develop prominent glandular thickenings along the parapodial field, as a result of which they are wider than deep. Behind X the thoracic region tapers into the abdomen, the transition into which is somewhat abrupt. Annulation of the somites is obscure, only the posterior thoracic and anterior abdominal showing faint indications of subdivisions. There are fourteen well-marked ventral plates, the first on III, the last on XVI, behind which more obscure wrinkled and subdivided areas continue to the end of the thorax. The first five are short, about four or five times as wide as long. The others are very smooth, apparently very vascular and probably deep red in life, the relative width gradually increasing from equality to the length to double it, the greatest width in all cases being anterior, so that the entire series appears serrated laterally. By the sides of each is a pair of rough glandular areas which posterior to XVI become united with the glandular ventral areas, giving them an irregular polygonal outline and

roughened surface. Slight traces of similar structures continue on to a few anterior abdominal segments. Middle and posterior abdominal segments are marked about the middle in the parapodial zone by a distinct, elevated, glandular ring, the remainder of the body wall being relatively thin and translucent. Pygidium slightly expanded and bent dorsad, the large anus surrounded by a raised border.

Branchiæ two pairs, on somites II and III, when contracted partially protected by the lateral wings and dorsal fold. As in *Scionopsis palmata* Verrill they are very unequally, asymmetrically and irregularly developed. Both specimens have all four present. On the type the right anterior is much the largest and situated exactly in the median line, the left anterior is very small; those of the posterior pair are symmetrical in position and close to the median line, and intermediate in size between those of the anterior pair, that of the left side being slightly larger. The cotype has the anterior left largest, then the posterior right, the posterior left and the anterior right quite small. The well-developed branchiæ consist of a rather tall, column-like trunk which at once divides into several (3 to 5) main limbs which diverge and spread more or less horizontally. Each main limb consists of a tapering, strongly zigzag axis which may be traced to the tip and gives rise at each bend to similar lateral branches which also spread horizontally and divide into branches of the third order. Most of the latter bear two to six slender filaments which occasionally bifurcate or divide even farther and are usually (but not always) confined to one side of the branch. Thus is produced a very beautiful and characteristic plume-like structure more or less complexly branched according to the size of the gill and having nearly the form of a branch of certain species of the plant *Selaginella*. The main divisions of the large gill of the type specimen spread symmetrically and are so large that the second pair of gills is completely concealed beneath their posterior limbs, although these are much shorter than the anterior limbs.

Setigerous tubercles occur on somites IV to XX inclusive, separated from the uncinigerous tori by a slight interval and nearly in line with them. They are nearly cylindrical but somewhat compressed antero-posteriorly. Thoracic uncinigerous tori begin on V and are raised on thickened glandular areas. The first two are longer than the others which are of nearly uniform length. Nephridial papillæ exist above those of VII to XVI at least. Abdominal tori are small but prominent and decrease in vertical extent caudad. All are distinctly bilobate, having the angles, especially the dorsal angle, produced, bent forward and free from uncini.

Setæ in prominent flattened fascicles, arranged in two series of about fourteen to sixteen each, those of the anterior row about one-half as long as those of the other. Rather stout (Pl. IX, fig. 48), pale yellow, slightly curved and tapered to an acute tip, bilimbate with well-marked, lanceolate, entire but striated blades rather wider on the convex side. Uncini in single series pointing forward on somites V to X and on all abdominal somites, in double interlocking series on somites XI to XX, 105 on V, 98 more crowded on VII, and about 65 in each row on XII. On abdominal tori their number decreases from before caudad, there being 32 on XXI, 25 on XXXV, etc. Uncini of somites V to VII (Pl. IX, fig. 49) have the base prolonged into a slender manubrium with a thin membranous border and a prominent anterior angle, the beak is long and slender and the low crest formed of a few large teeth; guard slightly developed. On somites VIII to X the manubrium becomes gradually reduced and the remaining thoracic tori bear uncini of the form shown in fig. 50, which have the base short, without a manubrium, convex below, with slender ligament, well developed guard, stout beak, and high crest of several transverse rows of teeth. Abdominal uncini (fig. 51) are small, with short base convex below and provided with slender anterior and posterior ligaments, no guard and beak and crest nearly as in posterior thoracic uncini.

The color has faded, but in life is probably chiefly translucent green or olive green, with scattered flakes of white and deep red blood spots behind the ventral plates and below the setigerous tubercles.

Type locality, San Diego; E. C. Starks, collector. Two specimens, the type a female filled with large eggs.

***Thelepus crispus* Johnson.**

Thelepus crispus Johnson, Proc. Bos. Soc. Nat. Hist., XXIX, p. 428; Pl. 17, figs. 175-178b.

Common at both San Diego and Monterey; at the former between tides and at the latter above and below low water. At Monterey Bay specimens were taken at "big tide pool," June 28, 1904, point above Third Beach, July 12, 1904, and dredged at Delmonte wharf, same date.

Young and half-grown examples possess numerous eyes, but full-grown ones are nearly or quite eyeless. All specimens examined by me have the deep end of the uncini narrower than in Johnson's figure and the knob terminal with no projection beyond it. The uncini differ constantly from those of *T. hamatus* in the prominence of the large crest teeth, while the row of smaller apical teeth is very little developed or absent. Those of *T. hamatus*, on the contrary, have

the crest teeth less prominent but more numerous and subdivided. The tubes resemble those of *T. cincinnatus*; sometimes they are covered with shell sand.

Polycirrus sp. ? (Plate IX, fig. 54).

A much macerated *Polycirrus*, dredged at Delmonte wharf, Monterey Bay, on July 12, 1904, has uncini very closely resembling those of *P. aurantiacus* (Grube) Malmgren, but is too imperfect for description.

Polycirrus californicus sp. nov. (Plate IX, figs. 52, 53).

The type is 28 mm. long, about 1.5 mm. in maximum diameter and has 65 segments, 28 of which are setigerous.

Prostomium large, projecting far forward as a long, narrow, highly arched lobe shaped much like the inverted bowl of a spoon, about twice as long as wide and equaling the first four segments. No eyes. Tentacles very numerous, forming a densely tangled mass which conceals much of the anterior end of the body, of two kinds, one very slender and delicate, slightly enlarged distally and arising from a pair of lateral areas, the other stouter with thin marginal expansions and arising from a transverse band near the anterior border of the tentaculiferous area.

Peristomium a short, simple ring bounding the mouth; other segments varying in size with the degree of distention of the coelom, the anterior ones faintly biannulate and the intersegmental furrows usually rather obscure; dorsum smooth and strongly arched, a longitudinal furrow immediately above the setigerous tubercles. Venter with a deep neural groove bounded by prominent lateral muscular ridges supporting the parapodia.

First ventral plate entire, equilaterally triangular, the apex forward, extending the entire length of the peristomium and somite II, followed by eight short, oblong, ventral plates, each divided into equal quadrate halves by the deep neural groove, the first five reaching the full length of somites III to VII, the remaining three on segments VII to X being reduced in size.

The last ten or twelve segments taper very rapidly to a minute simple pygidium. Coelom packed full of small eggs.

Setigerous tubercles begin on II and continue to XXIX (inclusive). They are small, project dorsad and laterad and bear small fan-shaped fascicles of delicate colorless setæ arranged in pairs of a small simply capillary setæ and a longer limbate one. After about XX the fascicles become much smaller and inconspicuous. Tori begin on XIV, at least no trace of uncini can be detected anterior to this segment.

At first they are long, narrow ridges reaching nearly to the middle line and bearing a single series of about sixty uncini. Posterior to the setigerous region the tori are shorter and thicker and bear only about forty uncini.

Uncini are small and delicate, the base with prominent posterior angle, the rostrum slender and acute and about half as long as the base, crest with two large profile teeth. Anterior uncini (Pl. IX, fig. 52) have the base less produced and blunter in front than those from posterior tori (Pl. IX, fig. 53).

The uncini closely resemble those of *P. nervosus* v. Marenzeller, but the latter has thirty-two setigerous segments and differs in the character of the tentacles, the ventral plates and other features.

Besides the type there is one additional incomplete specimen, both having been taken at San Diego.

AMPHICTENIDÆ.

Pectinaria brevicoma Johnson.

Pectinaria brevicoma Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), pp. 423, 424; Pl. 15, figs. 151-156.

A single specimen taken at Delmonte wharf, in the vicinity of Monterey Bay, on July 12, 1904, agrees with Johnson's description. The tube is constructed of coarse sand grains.

CAPITELLIDÆ.

Notomastus tenuis sp. nov. (Plate IX, fig. 55).

A slender elongated worm, the single example of which is macerated in the middle but well preserved at the ends. The two pieces probably represent a nearly or quite complete worm which is 118 mm. long and .8 mm. in diameter. Thoracic segments number 12 and abdominal 191. The thorax of 12 segments is clavate, the anterior half thickened, the posterior gradually narrowed, the abdomen abruptly expanded to equal the maximum width of the thorax, then tapering gently to the pygidium.

Prostomium conical, pointed, with a few specks of pigment scattered along the sides; when retracted somewhat inflated and completely closing the mouth.

Peristomium simple, achætous. Thorax clavate, terete, smooth and scarcely iridescent, the intersegmental furrows faint; widest segment about two-fifths as long as wide, narrowest two-thirds as wide as long, most of them equally and obscurely biannulate, the inter-annular furrow with a backward bend or inset into the succeeding one at the position of the lateral organs. Neuropodia and notopodia

represented by small linear depressed tufts of capillary setæ, the notopodial setæ fewer and less crowded.

Anterior and posterior abdominal segments are relatively short (one-half to two-thirds as long as wide) and separated by deep intersegmental furrows; in the middle macerated region the segments are stretched to about twice their diameter. Except at the posterior end, where the segments are somewhat angulated, the body is terete. Pygidium (possibly regenerated) a simple, short, subconical ring.

No gills, genital pores, or lateral sense organs are visible.

Abdominal tori are short and scarcely visible. The anterior notopodia bear about ten and the posterior about six crochets, while anterior neuropodia have 16-18 and posterior neuropodia about 10 crochets.

Crochets (Pl. IX, fig. 55) very small and all alike, with a distinct shoulder and a swelling neck bearing a very small head enclosed in a large hood.

San Diego, Cal.; type only known.

Eunotomastus gordiodes sp. nov. (Plate IX, fig. 56).

Evidently an elongated and slender species, but none of the specimens is nearly complete. The longest pieces are 60 mm. long and 1 mm. diameter.

Prostomium a minute blunt palpode bearing a pair of nuchal organs.

Peristomium a truncate, subconical, smooth segment slightly longer than somite II and somewhat constricted about the middle. A pair of small spots probably represent openings of the lateral organs.

The thorax consists of seventeen setigerous segments in addition to the peristomium, terete, of nearly uniform diameter, slightly contracted toward the posterior end, very smooth and with faint and often obsolete intersegmental furrows. All of these segments bear small notopodial and neuropodial tufts of setæ, the former separated by a distance slightly greater than the latter. A very faint depressed spot on each side of the segment somewhat nearer to the notopodia than the neuropodia seems to be the orifice of the lateral organ; and almost equally obscure pores at the same level and in most of the posterior intersegmental furrows may be genital orifices.

Anterior abdominal segments scarcely differ from the thoracic, being similar in shape and proportions but less polished and iridescent, farther back they become longer but remain smooth and ill-defined. The largest number of abdominal segments on any one piece is ninety-five. Abdominal neuropodia form distinct ventro-lateral tori, somewhat elevated and glandular, connected ventrally only by a glandular

line and bearing a series of crochets extending over about one-sixth of the body circumference. Notopodia similar but smaller, the first bearing capillary setæ, the others crochets. Number of neuropodial crochets on XIX 12-14, on XXV 32, notopodials on XXV 16.

Posterior abdominal segments bear rather conspicuous tufted dorsal gills, each consisting of eight or ten short filaments arising close together from the posterior margin of the segment in line with the notopodia. The most anterior of these gills are small and somewhat pectinate, farther back they increase in size until the filaments have a length of one-third to one-half the diameter of the segments.

All setæ are of the usual limbate, capillary form with very slender tips. The crochets (Pl. IX, fig. 56) have a distinct shoulder, a neck that gradually increases in diameter to a rather large head with stout beak and high crest enclosed in a short but much inflated hood.

Each of the specimens is enveloped in a thin membranous tube covered by a single layer of loosely attached sand grains.

Taken only at San Diego at low water by E. C. Starks; four specimens.

As both this species and the type of *Eunotomastus* are known from incomplete specimens it is by no means certain that *E. gordiodes* is correctly referred to this genus.

Dasybranchus giganteus (Moore) (Plate IX, fig. 57).

Notomastus giganteus Moore, Proc. Acad. Nat. Sci. Phila., 1906, pp. 227, 228; Pl. X, figs. 24, 25.

Specimens in this collection much better preserved than the type enable me to correct and amplify the original description and to correct the generic reference. The stout form and large size are of course not at all noteworthy in the genus to which the worm is now referred.

Prostomium much retracted so that the tip alone is visible. Protruded proboscis subglobular, bulbous, with a rosette-like end presenting eight sulcated radiating lobes and proximad to this a closely granulated basal ring.

All six specimens have twelve thoracic segments. Peristomium about as long as succeeding segments, achætous and biannulate. Remaining thoracic segments setigerous, strongly biannulated and areolated on the surface. Notopodial and neuropodial fascicles both simple linear tufts borne on the posterior ring just behind a tenon-like inset of the anterior ring. Except on the first two or three setigerous segments the neuropodial fascicles are nearly twice as wide as the notopodial and separated by a ventral interval of nearly one-half the body diameter, the inter-ramal interval being slightly more than

the inter-notopodial interval on anterior segments and nearly twice as great on XII.

Abdominal segments about half as long as thoracic, usually irregularly biannulate, thickly glandular anteriorly but (except at the tori) becoming thin-walled posteriorly. Neuropodial tori extensive low ridges, reaching on anterior segments from above the middle level nearly to the neural line, but posteriorly scarcely half as long. They become more elevated dorsally and end abruptly in a prominence, above which is the small but distinct rounded ovoid lateral organ. The very small notopodial tori are dorsal and connected across the dorsum by a low transverse fold. Posteriorly they become very obscure.

Branchiæ are retractile and usually obscure anteriorly; on middle and posterior abdominal segments they become conspicuous bushy tufts composed of numerous (about 20-30) filaments arising from the posterior end of the notopodial tori, or posteriorly, where the tori become obsolete, replacing them.

Abdominal lateral organs are distinct only posteriorly where the tori become widely separated, appearing halfway between them as small rounded elevations, above and below which a few small papillæ are scattered. Thoracic lateral organs and genital pores were not observed.

The original drawings of crochets of this species were made from imperfect specimens and a corrected representation is shown in fig. 57, Plate IX.

Six specimens of this species, one of which is 6 mm. in diameter, occur in the Starks collection and were taken at San Diego between tides.

***Dasybranchus glabrus* sp. nov.** (Plate IX. fig. 58).

Body moderately stout, terete, and thickest anteriorly where it is shaped much like a small earthworm; posteriorly more slender and gently tapered, subquadrate, flattened below. The type and only specimen is 45 mm. long with a maximum diameter of 2.4 mm. Thoracic segments 14, abdominal 157.

Prostomium partially retracted within the collar-like anterior border of the peristomium, the exposed part bluntly rounded anteriorly with a slight ventral longitudinal furrow.

Peristomium a long, deeply biannulate segment (perhaps two segments) as long as any two of those following; the first ring is marked by several shallow furrows. Entire thorax with firm, smooth, thickly glandular walls, with very few markings; the segments all uniannulate

and separated by deep intersegmental furrows. Thoracic notopodia and neuropodia bear short, equal, retractile linear tufts of setæ, the neuropodia being about twice as far apart as the notopodia and the distance between the latter about equaling the interramal space. Lateral sense organs quite evident, slit-like pores near the caudal border of the segments and nearer to the notopodia than the neuropodia.

Abdominal segments very short and much crowded, especially toward the anterior end; posteriorly they are obscurely biannulate and less crowded. Anterior abdominal segments are terete and have thick glandular walls much like the thoracic segments; farther back the walls become thinner and non-glandular and except in the region of the tori the surface is granular, and, chiefly owing to the separation of the tori dorsally and ventrally, the section becomes subquadrate. Anterior abdominal segments have no distinct tori, but bear a continuous line of sessile crochets which appear to completely encircle the segment at the middle. After about the twelfth abdominal segment a slight lateral or interramal break appears and gradually widens until the notopodia and neuropodia become well separated and distinct tori. The neuropodia of each pair remain, however, continuous across the neural surface, but except on a few anterior segments the notopodia are discontinuous and posteriorly become separated quite widely. Lateral sense organs are obscure on anterior abdominal segments, but on middle and posterior segments become distinct though small rounded eminences. Pygidium probably injured as it is divided into several very irregular lobes.

Gills appear only in the posterior half of the body, usually as two, or sometimes three, short, hollow, sausage-shaped filaments issuing from a pore immediately dorsal to the neuropodium.

Thoracic setæ are exclusively of the usual tapering capillary form with narrowly bilimbate ends. Abdominal segments bear exclusively very numerous crochets of one form in both notopodia and neuropodia (Pl. IX, fig. 58). They are slender without a distinct shoulder, but with a subterminal enlargement that tapers to a small head with hooked beak and three small teeth in the vertex of the crest, the end enclosed in a somewhat inflated hood.

The type was taken at San Diego Bay in December, 1902.

This species differs from typical members of the genus in having two more than the usual number of thoracic segments.

MALDANIDÆ.**Maldane disparidentata** Moore.

Maldane disparidentata Moore, Proc. Acad. Nat. Sci. Phila., 1904, pp. 494-496; Pl. XXXVIII, figs. 28-31.

This species occurs in the collections from San Diego only, but appears to be quite common there.

One bottle contains, along with a specimen of this annelid, a small amphipod determined by Prof. S. J. Holmes as *Melita* sp. which the label states lives commensally in its tube. From *M. biceps*, to which it is most nearly related, this species is readily distinguished by having more numerous and blunter teeth on the anterior division of the cephalic limbus, the last preanal segment uniannulate instead of biannulate, and the emargination on the ventral division of the caudal funnel entire instead of emarginated and slightly lobate. The fringed setæ are of the bispiral type.

Clymenella rubrocincta Johnson.

Clymenella rubrocincta Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), pp. 418, 419; Pl. 13, figs. 128-133.

The anterior half of one was taken between tides at San Diego.

AMMOCHARIDÆ.**Ammochares occidentalis** Johnson.

Ammochares occidentalis Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), pp. 420-421; Pl. 14, figs. 140-142.

A single example from San Diego. It is a beautifully preserved specimen 30 mm. long, with 22 setigerous segments. A fragment of a tube is formed entirely of particles of shells.

Sclerocheilus pacificus sp. nov. (Plate IX, fig. 59).

Form as in *Scalibregma*, clavate, the posterior two-thirds slender and of nearly uniform diameter but tapering slightly caudad; the anterior one-third abruptly swollen to three times the posterior diameter. Length 25-35 mm., maximum diameter 2.5-3.6 mm. Segments 60-72.

Prostomium depressed T-shaped, the basal part about as broad as long and nearly half as wide as the peristomium, into which it is deeply retracted. Antero-lateral limbs blunt projections each about half as long as the width of the body of the prostomium. On each side of the posterior dorsal region is a broad, black oblique streak which appears to be constituted of two parallel rows of small pigment specks. At their anterior ends they are separated by one-half the width of the body of the prostomium, but diverge as they pass backward beneath the peristomial fold apparently into the nuchal organs.

Peristomium a short, simple, unsculptured ring incomplete ventrally where it reaches the sides of the mouth. Somite II also a simple ring, but bearing lateral parapodia and bounding the mouth behind. Succeeding somites increase in diameter and become rapidly inflated; III, IV and V are biannulate, with the larger setigerous annulus posterior, the smaller annulus apparently arising in the intersegmental furrow; VI and succeeding somites of the anterior region have the setigerous annulus divided equally by a furrow that appears just behind the setæ. Each of the three rings thus formed is divided by short deep furrows into a ring of tessellæ or subquadrate areas which are much more conspicuous on the dorsum than on the venter. In the posterior region the interannular furrows become very faint or completely disappear, leaving well-marked simple segments, generally about one-fourth or one-fifth as long as wide and only very obscurely areolated.

Pygidium a simple, slightly oblique ring which bears no cirri on either the type or cotype. Body walls very thin and readily ruptured. Proboscis partly everted as a smooth broadly trilobed disk.

Parapodia merely obscure lateral swellings involving the entire length of the somites in the anterior enlarged region and bearing the two well-separated linear tufts of setæ opposite to the middle annulus. Apparently there are no cirri, unless the minute knobs related to the setæ fascicles prove to be such. Gills are totally absent.

Setæ colorless with a faint bluish luster, chiefly capillary, of various lengths, curved and slightly flattened distally. Anteriorly they are most conspicuous, forming fan-shaped tufts with linear bases, the neuropodial more spreading, the notopodial longer and curved dorsad; the longest setæ about as long as the segment. Posteriorly the setæ are fewer and less slender. Short inconspicuous furcate setæ (fig. 59) are paired with the capillary setæ on all except a few anterior segments on which they cannot be seen. There are no stout setæ on II.

The type, a mature male, and a smaller cotype were taken at Third Beach Point, vicinity of Monterey Bay, by Mr. Spaulding on July 6, 1905.

This species as described differs widely from the type of the genus, especially in the absence of stout setæ on II and the absence of neurocirri, though it is possible that the latter, like the caudal cirri, may be easily detached. On the other hand the absence of gills and the presence of eye-spots are characters which approximate it to the type, *S. minutus* Grube. This species would also seem to indicate that the creation of *Asclerocheilus* as a separate genus is unnecessary.

CHLORHÆMIDÆ.

Brada sp. ? juv.

Two small specimens dredged at a depth of forty feet at San Diego are considered to be the young of a species of *Brada* or possibly of a *Trophonia* in which the anterior setæ have not yet elongated. They are about one-half inch long, clavate, with well-marked, simple segments, a few of which have been lost, thickly and uniformly covered with papillæ both dorsally and ventrally, those in the neighborhood of the parapodia scarcely longer than the others. All setæ are short, only the notopodials of II being noticeably longer than the others. On other segments both notopodial and neuropodial tufts consist of a very few small, slender, tapered, flexible setæ composed of numerous joints which are always considerably longer than the diameter of the seta. Neuropodials are no stouter than notopodials. The setæ differ from any species of *Brada* or *Trophonia* examined by me, but the differences are such as might be expected in juveniles.

Trophonia papillata Johnson.

Trophonia papillata Johnson, Proc. Bos. Soc. Nat. Hist., XXIX (1901), p. 416; Pl. 12, figs. 122, 123.

Two specimens dredged at Delmonte wharf, Monterey Bay, July 12, 1904.

The larger one has the head protruded. The mouth is a transverse crescentic slit bounded below by a flat, slightly bilobed lip and above by the slightly arched and thickened prostomium which bears the two thick palps, grooved below, and above them eight tentacles in a transverse series; the latter are about one-fourth as thick as the palps and slightly exceed them in length. The small specimen is only 16 mm. long with 36 segments, badly abraded and nearly smooth except the anterior four segments which are encased in a coating of agglutinated sand grains. This may possibly be a distinct species.

Trophonia capulata sp. nov. (Plate IX, figs. 60, 61).

This very distinct species is represented by the type only, which measures, exclusive of the cephalic setæ, 108 mm. long, the cephalic setæ being 9 mm. and the maximum diameter at the end of the first fourth 5.5 mm. Number of segments 136, the first achætatus. Form elongated clavate, somewhat depressed at anterior end, subterete at middle, becoming gradually subquadrate posteriorly. Anterior half moderately stout, the posterior slender and gently tapered. Cœlom containing many large free eggs.

Prostomium and peristomium completely retracted within first setigerous somite, leaving a small opening directed somewhat ventrad

and surrounded by prominent papillæ, often arranged in groups, and encrusted with fine sand grains, a particularly prominent group of about four forming a small tuft supported on a narrow pedicle in the mid-dorsal line between the first pair of notopodial setæ fascicles.

Anterior end broadly rounded, the first few segments decidedly depressed but increasing in depth rapidly until by about VI they have become terete. These segments are short, crowded and somewhat telescoped, so that each one somewhat overlaps the next anterior, especially dorsally where this feature is emphasized by the greater prominence of the cutaneous papillæ. Remaining segments very regular, simple and smooth, with clean-cut though shallow furrows and from one-sixth to one-third as long as wide, becoming proportionately longer as the diameter decreases posteriorly. Pygidium a simple ring entirely lacking cirri.

Integument thick and tough and more or less coated with a hard, adhesive layer of fine sand, beyond which the tips of only the larger papillæ project. On the venter and posteriorly the surface is nearly smooth and the incrustation thin, but on the anterior dorsal region it becomes rough and much thicker, forming, with the papillæ, projecting anterior margins to the segments and ensheathing even the larger papillæ nearly to their ends. The larger cutaneous papillæ are arranged as follows: On the dorsal field is a transverse row of six or eight projecting forward from the cephalic margin of each anterior segment. In the ventral field on each side of the neural line and generally near the middle of the segment is a single clavate papilla, replaced on more anterior segments by a group of two or three; from one to three more occur ventrad of the neuropodium. Surrounding the latter is an irregular ring of papillæ composed usually of one or two dorsal and ventral, two to four anterior and usually three posterior, the middle one of the last group being much larger than the others and elevated prominently on a conical base. A similar ring surrounds the notopodium, the postsetal group here also consisting of one or two of moderate size, and one very large one, often equaling the segment in length anteriorly and elevated on a base which may bear the smaller papillæ as well. Passing from before caudad all of these papillæ gradually diminish in length, but their arrangement is constant.

Except on the first two or three segments, on which they are more crowded, the parapodia consist of widely separated notopodial and neuropodial nearly or quite sessile tufts of setæ. The former are fan-shaped fascicles of five to eight (the larger numbers on middle segments) flexible capillary setæ. Those of the first four (II to V)

are elongated and directed forward, becoming in both respects less so from before backward; on II and III they are remarkably slender and silky and project far in front of the head to a distance of more than twice the diameter of the body; those of V scarcely equal the body diameter. On middle segments the fascicles spread more widely over the dorsum and scarcely exceed the length of their segments. Posteriorly they appear relatively but not actually longer. Neuropodial setæ are slightly coarser and fewer than the corresponding notopodials; those of the first three fascicles have filamentous tips and project forward like the notopodials, but are only about half as long; on other segments they curve dorsad up the sides of the body.

Setæ are all pale brown, soft and iridescent. As long as they project forward notopodials and neuropodials are similar, excessively slender, with straight acute tips and numerous cross fractures or nodes, which at the base of fully-grown setæ occur five or six in a distance equal to the diameter, becoming gradually fewer until they are six or eight times as far apart. As they lose the filamentous tips the notopodial setæ have the region of crowded joints toward the base much restricted (Pl. IX, fig. 61).

Neuropodial setæ in becoming shorter and stouter also acquire fewer and much longer joints, the terminal one becoming especially long and, beginning with V, with a distinctly hooked tip, which a few segments farther back becomes much larger and provided with an accessory process (fig. 60), thus having the form of a halter-snap like the setæ seen in certain species of *Sthenelais*.

Color deep buff-gray and nearly uniform.

Type locality, San Diego Bay, Cal., between tide limits.

Flabelligera commensalis sp. nov. (Plate IX, figs. 62, 63).

Form moderately slender, thickest in the cephalic fourth, thence tapering to caudal end but usually exhibiting irregular contractions or swellings; more or less distinctly prismatic and somewhat compressed; body-walls thin and delicate and more or less ruptured so that the viscera protrude. Type and largest complete specimen 50 mm. long and at the widest part (XX) 2.4 mm. wide and 3.2 mm. deep; this thickness, however, is probably in part due to an abnormal swelling. Number of somites 90; a second complete specimen 48 mm. long has 70 segments.

Prostomium with its appendages capable of complete retraction within the collar and only incompletely exposed in these specimens. So far as observed it consists of a pair of thin membranous dorsal lobes, each bearing a dense tuft of thirty or forty slender tentacular

filaments, the ends of which reach in extension scarcely beyond the ends of the collar setæ. The palpi, arising immediately beneath the tentacles and above the mouth, are more than twice as long and four or five times as thick as the tentacles, blunt, slightly tapered and finger-like, not at all spatulate or flabelliform, the venter with a deep longitudinal groove, the margins of which are merely slightly crenulate and not lobed. Mouth a transverse slit or a more rounded opening with lobed margins normally hidden at the bottom of the collar.

The collar region, reaching back as far as the first ordinary somite, probably represents the peristomium alone or perhaps both I and II. It consists of a short achætous posterior ring and a cylindrical or funnelliform, thin membranous collar with small dorso-median, ventro-median and lateral incisions in its border, the whole being about as long as the three somites next following. It bears the broad fan-shaped conjoined fascicles of notopodial and neuropodial setæ forming a close continuous series, which, like a palisade of stakes, build up the collar to double its own height. When the cephalic appendages are extended they are embraced by the peristomial collar and setæ cage and when retracted are concealed within them, the setæ of the two sides drawing toward the middle line. The collar, which clearly represents a pair of parapodia, is thickly studded with cutaneous papillæ, those at the base of the setæ being very numerous, much elongated and slender, with filamentous stalks bearing terminal knobs and often reaching the tips of the setæ.

Succeeding segments are much shorter, their length never exceeding one-third the width, and quite simple, with the intersegmental papillæ quite high between the parapodia but elsewhere very slightly developed. Anteriorly for a short distance the body is subterete or subquadrate, but for most of its length, owing to the position of the parapodia, is subtriangular in section, the somewhat truncated apex being ventral, the nearly flat base dorsal and the usually somewhat convex sides lateral. In places where the body is much distended this convexity or bulging may be sufficient to give to it a cross-section approaching the circular. As noted above the body-wall is thin, easily ruptured, and semi-translucent. Most of the surface is smooth and bears few and small papillæ, but on the dorsum and about the parapodia they become larger and more numerous, those on and near the notopodia being largest of all and, like the collar papillæ, bearing very large terminal knobs, and when extended reaching to the tips of the setæ and giving to the notopodia the aspect of erect tufts or tassels. The neuropodial papillæ on the other hand are much shorter and, like those scattered over the dorsum, bear small terminal knobs.

Parapodia are remarkable chiefly for the position of the neuropodia. The rami are rather large, widely separated and rather conspicuous papillæ. Notopodia situated at the extreme dorsal and widest part of their segments, except on the first few at the basal angles of the triangle. Owing to the slender papillæ which they bear they have the form of graceful plumes or tassels bearing a few small capillary setæ. Neuropodia are rather larger, stouter and shorter subconical tubercles, resembling the false feet of certain caterpillars, and bearing much smaller and less conspicuous papillæ and a single stout hooked seta. Except on the first eight or ten segments which are more or less subterete and where they are widely separated, the bases of the two neuropodia are nearly in contact at the neural apex of the compressed triangular body.

Notopodial and collar setæ (Pl. IX, fig. 62) are all of the capillary, soft, flexible, cross-fractured type, the former differing only in their much greater length. In addition to a few, scarcely apparent, rudimentary setæ of the same type each neuropodium bears one (or rarely two) large and stout hook (fig. 63), deep brown and opaque at the end, but becoming paler toward the base and having an imperfect joint below the hooked end. These hooks are directed toward the middle line and are operated in pairs by powerful muscles, forming most effective organs of adhesion.

Dorsal surface and notopodia more or less deep (sometimes purplish) brown, which color usually completely covers the collar and may extend somewhat down the sides of the body which, like the venter and neuropodia, is pale yellow, usually sharply contrasted with the brown of the dorsum which appears to be due to the sensory papillæ.

The alimentary canal exhibits the gizzard-like stomach and looped intestine characteristic of annelids of this family. Unlike most species of the genus there is no mucous investment, at least on these specimens.

The four known specimens were taken at Picnic Tables, near Monterey, Cal., on August 14, 1904, from among the spines of *Strongylocentrotus purpuratus*. The latter is undoubtedly a normal habitat, for which the structure of the worm admirably adapts it. The color, lateral compression of the body, position of the neuropodia and the stout neuropodial hooks would be especially useful in this situation.

SABELLIDÆ.

Sabella elegans Bush.

Sabella elegans Bush, Tubicolous Annelids from the Pacific Ocean, Harriman Alaska Expedition Reports, 1905, pp. 194, 195 (figures).

Vicinity of Monterey Bay only; four specimens "big tide pool,"

June 20, 1905; one small example dredged Delmonte wharf, July 12, 1904.

These specimens appear to belong to the above-named species, although Miss Bush's species of *Sabella* are not clearly differentiated in the brief descriptions. The spots on the branchiæ are usually five, fairly regular in arrangement, but varying much in intensity and the degree to which they extend on to the gill filaments. The number of rachises varies from 18 to 22 on each side. The segments of one counted number 70, 8 of which are setigerous thoracic.

***Distylia rugosa* Moore.**

Distylia rugosa Moore, Proc. Acad. Nat. Sci. Phila., 1904, pp. 499-501; Pl. XXXVIII, figs. 38-41.

Besides the type and cotype from which this species was originally described several additional specimens, all taken between tides at San Diego, occur in the collection.

The specimens are of various sizes, the largest measuring in its contracted state 105 mm. long, of which the gills are 30 mm., and 11 mm. wide. In the different specimens the branchial rachises vary in number from 24 in one 40 mm. long to 68 on each side of the large specimen. In no case are any of the rachises forked. The branchial bases make about $1\frac{1}{2}$ turns. The eyes referred to in the original description are mere specks and dashes of pigment arranged in two series which may coalesce into more or less broken lines or be totally absent.

Sometimes the branchiæ are of a nearly uniform wine brown with regular but obscure transverse pale bands; in other cases they may be light or dark brown, irregularly mottled with pale. The gill bases are uniform deep brown. At the dorsal end of each abdominal torus is a very deep and conspicuous brown spot, from which a narrow brown line runs along the torus for its entire length, ending in a small spot at the ventral end. The ventral plates are very deep purplish brown, the body elsewhere pale brown.

The largest specimen has the collar region so relaxed that the mouth parts are well displayed. The tentacles are narrowly lanceolate with a small divergent basal lobe and reach barely to the distal border of the branchial base.

***Pseudopotamilla brevibranchiata* Moore.**

Pseudopotamilla brevibranchiata Moore, Proc. Acad. Nat. Sci. Phila., 1905, pp. 559-562; Pl. XXXVII, figs. 8-14.

Two specimens taken at "big tide pool," Monterey Bay, present several interesting divergences from the types.

The branchial barbs are somewhat longer—four or five times the diameter of the rachises and diminished but slightly toward the distal end—and the dorsal branchial lappet is very prominent. Both specimens are filled with nearly mature eggs. One has nine setigerous segments, the other only six and the thorax shorter than the gills. The first has the eye-spots scattered through a wide zone and occasionally more than one on a rachis; the other has a single nearly black eye-spot proximad of the middle on most of the middle rachises. Both have the gills otherwise colorless.

The tubes form a cluster of three and are nearly colorless, stiff and hard and covered with an incrustation of fine sand. Two other empty tubes dredged near the same locality probably also belong to this species.

SERPULIDÆ.

Protula superba sp. nov. (Plate IX, figs. 64, 65).

The least contracted specimen of this magnificent serpulid has the body 88 mm. long and the contracted gill-crowns 37 mm. long; length of thorax measured along venter of mantle 37 mm.; width of thorax at anterior end 16 mm., at posterior end 12 mm.; depth at latter point 7 mm.; width of abdomen at middle 10 mm.; depth at same point 9 mm.; length of branchial base 9 mm.; length of one of the longest rachises 23 mm. Number of thoracic segments 8 (7 setigerous), of abdominal segments 115–120. Another specimen is even larger but more contracted.

The contracted branchial crowns form a pair of great compact brushes or plumes, the base and axis of which is a high spiral permanently wound into seven or eight close turns, stout and of firm texture throughout and triangular in section. They are readily detached, leaving a triangular scar on each side of the mouth. Leaving a short pedicel of attachment the branchiferous spiral begins on the dorsal side and bears in the one cotype on which they were counted no less than 320 radioles in a closely crowded series on each side. The basal ones are the longest and they diminish in length regularly to the apex at a rate that indicates that their tips reach a uniform level in full extension. A rather thick interbranchial membrane is connected with the outer faces of the basal ends of the rachises and unites them for about one-fifth of their length. The rachises are compressed triangular with the base directed outward and the apex toward the center; narrow membranous borders are appended to the basal angles and reach from the interbranchial membrane nearly to their

tips. A double rank of numerous pinnæ or filaments arises along the inner or apical face of the rachises and continues nearly to their tips; the longest of these scarcely exceed the greater diameter of the rachises and they diminish in length distally.

Tentacles lanceolate, foliaceous, about as long as the diameter of the branchial bases, to the ventral side of which they are attached. Just within them, enclosing the mouth and about one-third as high as the interbranchial membrane, are the oral membranes, which like the tentacles are detached with the branchial crowns. Mouth transverse, its corners bounded above by a low rounded elevation, from between which a tongue-shaped process projects over the mouth. Ventral to it is a soft irregular lip, and below this again a much larger firm triangular lip.

Thorax depressed, broader anteriorly than posteriorly and regularly tapered caudally. Segments eight, all but the peristomium setigerous; intersegmental furrows obsolete. Thoracic mantle thin and greatly developed, embracing all of the setæ tufts and extending beyond them to a width fully equal to that of the thorax. Though folded and somewhat tufted between the fascicles of setæ the margin of the membrane appears to be entire and not scalloped. Its cephalic border is divided into a pair of dorsal setal lobes, enclosing the collar seta tufts, and a ventral pair of branchial lobes. The median notch separating the latter is wide and shallow, the lateral notches, on the contrary, being deep and narrow. The posterior fold or apron is thicker, has an extensive glandular area and projects only slightly as a broad median ventral lobe. There is a broad but shallow and rather ill-defined dorsal thoracic groove and an annular groove, somewhat distinct on the dorsum, separating the thorax and abdomen.

Abdomen rather soft, broadly rounded laterally, slightly depressed, tapered gently to the pygidium and divided into dorsal, lateral or parapodial, and ventral or neural fields, the latter being marked by a broad, open fecal groove. Abdominal segments numerous, very short, much crowded, and distinctly indicated by the extensive tori only. Integument of dorsal and ventral surfaces more or less swollen and wrinkled, probably in part due to the preserving fluid. A calcareous incrustation occupies a nearly circular area on the dorsum of the caudal end, which is bluntly rounded and terminated by a very short pygidium containing a large, vertical, slit-like anus guarded by somewhat tumid lips.

Thoracic setæ form seven compact flattened tufts, somewhat spreading distally, of very numerous setæ; they project obliquely dorsad

and the collar tuft somewhat cephalad, the others caudad. The collar fascicle is subdivided into two, the others into three ranks closely united above but separating somewhat ventrally, the anterior rank being composed of smaller setæ and separated from the others by a small membranous fold. All thoracic setæ (Pl. IX, fig. 65) are similar, pale yellow, narrowly bilimbate, the more dorsal ones somewhat longer and those of the posterior rank slightly curved. Abdominal fascicles are much smaller, with seldom more than twelve shorter but otherwise similar setæ. At the caudal end a certain number of segments bear much longer, very slender capillary setæ without limbæ.

Thoracic tori are very difficult to discern, the long, somewhat irregular series of very numerous uncini being nearly embedded in thick glandular areas below the setæ tufts. The narrow, vertical abdominal tori occupy the sides of the segments rather toward the venter. They are crowded fleshy folds slightly free and projecting at both ends, longer in the middle of the abdomen, becoming shorter toward both ends, and finally obsolete caudally. Uncini (Pl. IX, fig. 65) very numerous, not less than 350 on VIII, small, with the toothed margin very long, conspicuously elevated above and prolonged into a slender, blunt and slightly bifid or notched process below and bearing twenty to twenty-five long, slender, acute teeth, of which four or five smaller ones are on the inferior prolongation. No difference between thoracic and abdominal tori was perceived. At the ventral end of each abdominal torus is a small group of simple spines which persist through the caudal region after the uncini have ceased.

All of the four specimens examined are quite colorless and totally lack pigment. The preserved worms bear a striking resemblance in form to the conventionalized classic torch with the vigorous and somewhat divided flame represented by the gill plumes, which when living and extended must form a magnificent crown.

Tube white, thick, massive, the walls often 5-6 mm. thick and the outer diameter up to 19 mm. The inner layers are hard and stony, the lining somewhat polished, the outer layers becoming chalky and the outer surface roughened by numerous growth lines. The older parts make several irregular open coils beneath and around stones, the newer portions extending freely horizontally into the water, in one case to a distance of 145 mm. Orifice perfectly terete, smooth, polished and thin.

The type (No. 79, Coll. Acad. Nat. Sci.), together with the tube and two other worms, were collected for the Academy at Pacific Grove,

near Monterey Bay, at a depth of 40 fathoms, by Prof. Harold Heath. A single example appears in the Stanford University collection, and was taken by a Chinese fisherman on a red-cod line in the vicinity of Monterey Bay on February 20, 1902.

Several species of *Protula* have been described from the Pacific, and it is possible that *P. atypa* Bush or some of the other smaller species may be the young of this, but they have far fewer branchial rachises. Indeed this species departs from typical members of the genus in the large number of rachises and complexity of the gill-bearers or bases.

Serpula columbiana Johnson.

Serpula columbiana Johnson, Proc. Bos. Soc. Nat. Hist., XXIX, pp. 432, 433; Pl. 19, figs. 199-204.

"Lighthouse Point," vicinity of Monterey Bay, in a big tide pool, June 28, 1904. Three medium-sized specimens with portions of tubes.

The operculum is more slender and has a more finely serrated margin than the one figured by Johnson. One counted had 140 serrations and ribs and 38 pairs of branchial rachises.

HERMELLIDÆ.

Sabellaria californica Fewkes (Plate IX, figs. 66a and b).

Sabellaria Californica Fewkes, Bull. Essex Inst., XX (1889), pp. 130-132; Pl. VII, figs. 3 and 4.

Only two specimens from San Diego are contained in the collection. In the vicinity of Monterey Bay the species appears to be more abundant, specimens being present from "Lighthouse Point," June 28, 1904; "big tide pool," June 20, 1905, and Delmonte wharf, dredged July 12, 1904.

The degree of pigmentation differs greatly, some being pale, others deep brown, the latter type strongly prevailing.

This species is readily distinguished from the next by the character of the opercular spines, which, with the exception of those of the concealed inner series, are opaque, dark brown or black. The exposed parts of the outer series are erect, of the inner and middle series recumbent, whereas in *S. cementarium* the yellow spines of all three series are more or less erect, those of the middle series being very prominently so. The exposed parts of both the inner and middle series of this species are placed at right angles to the slender stem or tendon. The long, pick-like spines of the middle series (fig. 66a) are very hard and the pointed, slightly hooked tips frequently interdigitate and cross in the middle, completely concealing the inner whorl. The latter (fig. 66b) are much more delicate, flattened, yellow, some-

what chaff-like structures, the divided and densely fringed tips of which often embrace the ends of the middle series of spines.

The tubes of this species Fewkes describes as forming great masses of agglutinated sand grains and shell fragments in the caverns of wave-worn cliffs. Those of *S. cementarium*, so far as known, occur singly or in small groups attached to shells and stones. Which one of these species, if either, was described by Baird under the name of *S. saricava* it is impossible to determine from the brief description. So far as it goes the description fails to fit either, and it seems probable that a third species is represented on this coast.

Sabellaria cementarium Moore.

Sabellaria cementarium Moore, Proc. Acad. Nat. Sci. Phila., 1906, pp. 248-253; Pl. XII, figs. 45-51.

Two specimens among *S. californica* from "big tide pool," Monterey Bay, June 20, 1905.

EXPLANATION OF PLATES VII, VIII, IX.

PLATE VII.—*Trypanosyllis intermedia*—figs. 1 and 2.

Fig. 1.—End of seta from somite X, $\times 360$.

Fig. 2.—Same from somite L, $\times 360$.

Phyllodoce medipapillata—figs. 3 and 4.

Fig. 3.—Parapodium from somite X, $\times 24$.

Fig. 4.—Seta from somite XXV, $\times 360$.

Eunice paloloides—figs. 5-7.

Fig. 5.—Compound seta from somite C, $\times 440$.

Fig. 6.—Ventral view of mandibles, $\times 9$.

Fig. 7.—Dorsal view of maxillæ, $\times 9$.

Marphysa stylobranchiata—figs. 8-12.

Fig. 8.—Simple acute seta from somite XXV, $\times 250$.

Fig. 9.—Simple pectiniform seta from same, $\times 440$.

Fig. 10.—Compound seta from same, $\times 440$.

Fig. 11.—Mandibles from ventral side, $\times 24$.

Fig. 12.—Maxillæ from dorsum, $\times 24$.

Marphysa californica—figs. 13-20.

Fig. 13.—Simple seta from dorsal portion of upper tuft of XXV, $\times 250$.

Fig. 14a and b.—Two forms of simple pectiniform setæ from somite XC, $\times 440$.

Fig. 15.—Compound seta with appendage of moderate length from somite XXV, $\times 360$.

Fig. 16.—Hooded crochet from somite C, $\times 360$.

Fig. 17.—Ventral view of mandibles, $\times 9$.

Fig. 18.—Dorsal view of right mandible, $\times 9$.

PLATE VIII.—*Marphysa californica*.

Fig. 19.—Dorsal view of maxillæ of left side in normal relation, $\times 9$.

Fig. 20.—Dorsal view of right maxillæ partly separated, $\times 9$.

Drilonereis nuda—figs. 21-23.

Fig. 21.—Parapodium C, anterior face, $\times 83$.

Fig. 22.—Seta from middle of same, $\times 360$.

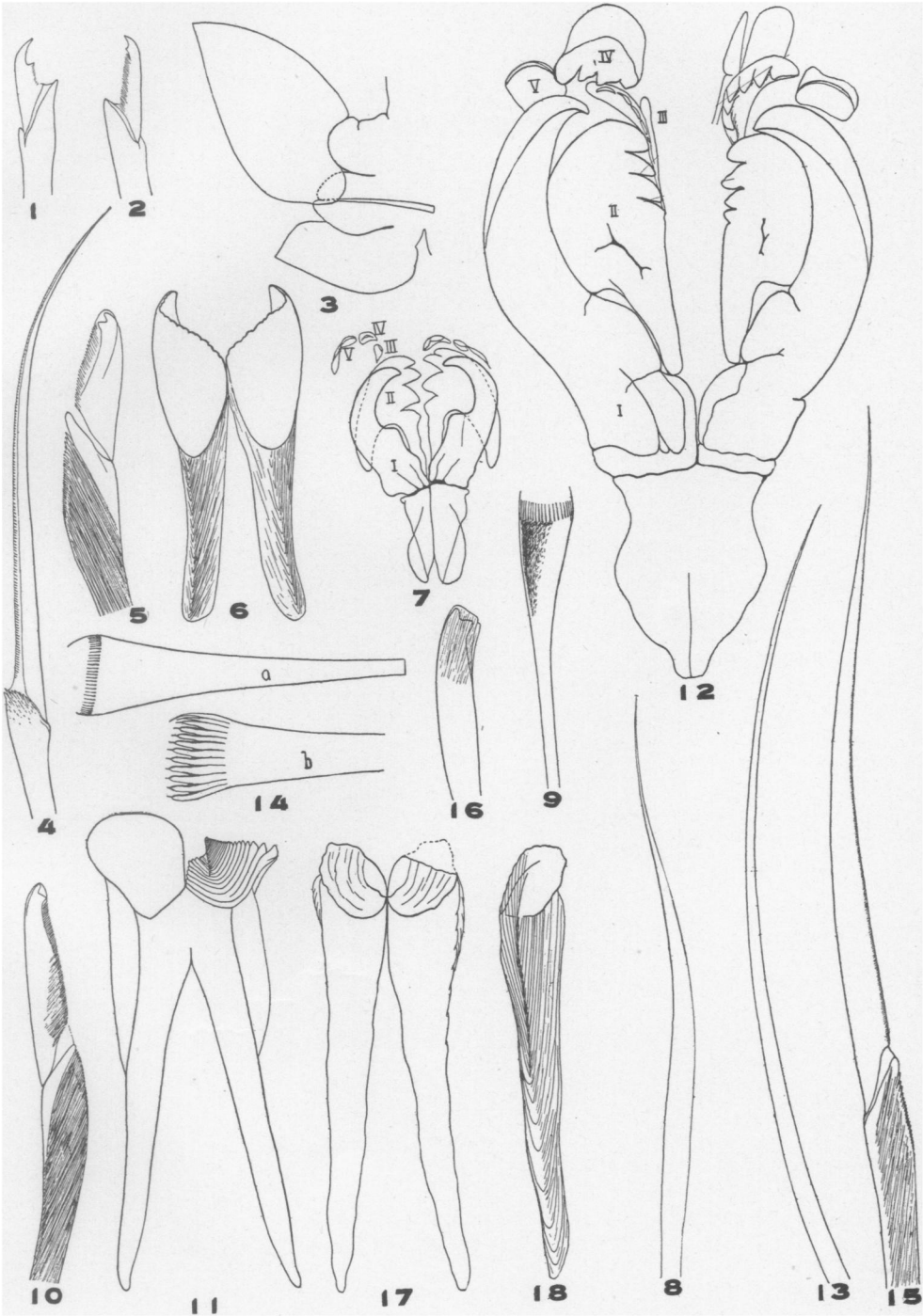
Fig. 23.—Dorsal view of jaws, $\times 24$.

Stauronereis moniloceras—figs. 24-29.

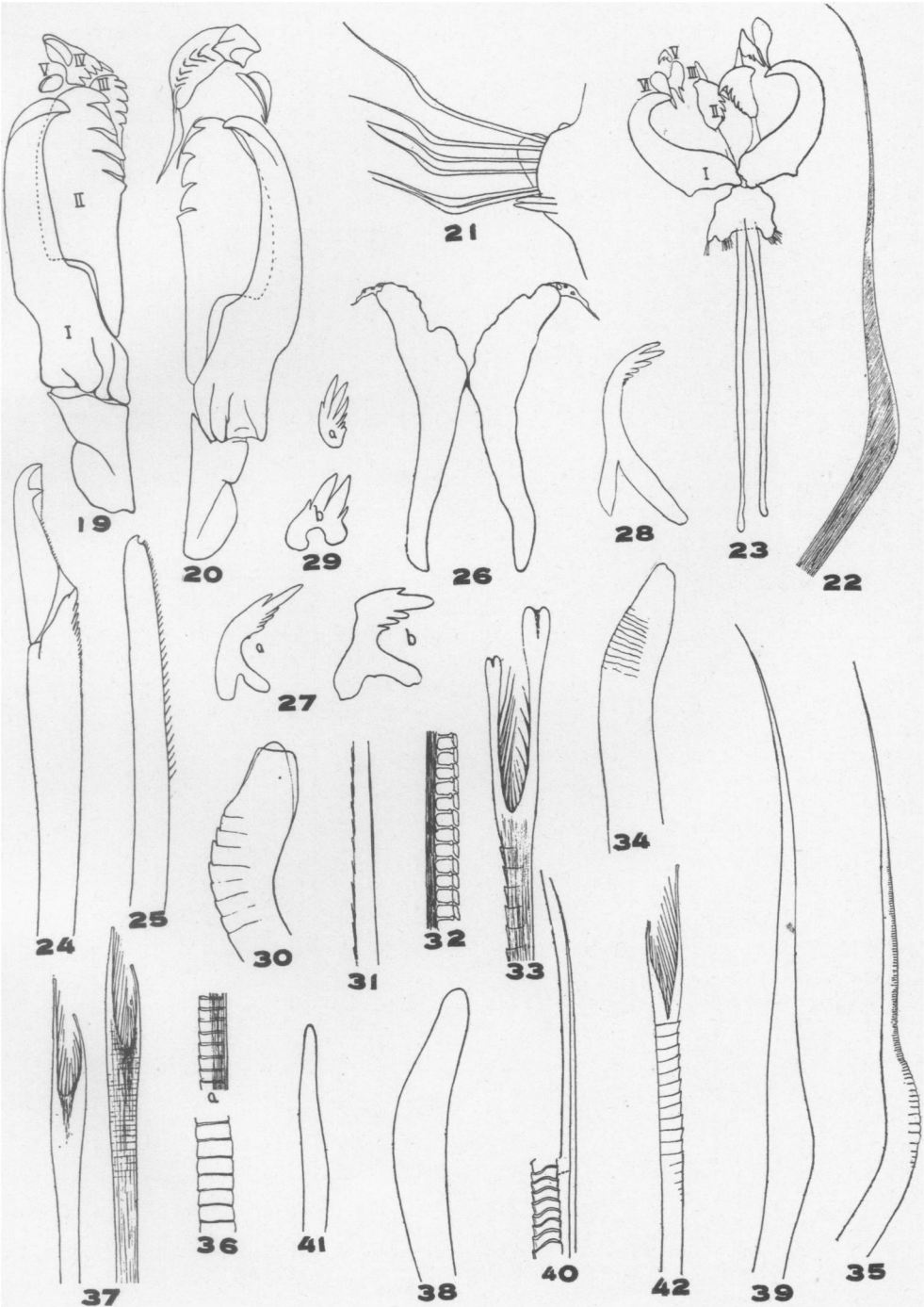
Fig. 24.—Compound seta from parapodium XXV, $\times 440$.

Fig. 25.—Tip of a coarser simple seta from XXV, $\times 600$.

- Fig. 26.—Ventral view of mandibles, $\times 24$.
 Fig. 27.—Anterior (a) and posterior (b) maxillæ of outer series, $\times 83$.
 Fig. 28.—Anterior maxilla of middle series, $\times 83$.
 Fig. 29.—Anterior (a) and middle (b) maxillæ of inner series, $\times 83$.
Aricia johnsoni—figs. 30–33.
 Fig. 30.—Tip of stout neuropodial seta from somite X, $\times 600$.
 Fig. 31.—Portion of slender neuropodial seta from somite L, $\times 600$.
 Fig. 32.—Optical section of a portion of a notopodial seta from somite L, $\times 600$.
 Fig. 33.—End of a furcate notopodial seta from somite C, $\times 600$.
Naineris robusta—figs. 34–37.
 Fig. 34.—Stout neuropodial seta from somite XXV, $\times 250$.
 Fig. 35.—Slender neuropodial from same, $\times 250$.
 Fig. 36.—Face (a) and profile (b) views of a portion of a capillary notopodial seta from somite C, $\times 600$.
 Fig. 37.—Two furcate notopodial setæ from somite C, $\times 360$.
Naineris longa—figs. 38–42.
 Fig. 38.—Stout neuropodial seta from posterior series of somite XX, $\times 250$.
 Fig. 39.—Slender neuropodial seta from anterior series of somite XX, $\times 250$.
 Fig. 40.—Notopodial seta from somite XX, $\times 83$.
 Fig. 41.—Neuropodial spine from posterior series of a middle somite, $\times 250$.
 Fig. 42.—Furcate notopodial seta from middle region, $\times 360$.
 PLATE IX.—Fig. 43.—*Tharyx multifilis*—Anterior end of cotype, $\times 9$.
 Fig. 44.—*Dodecaceria pacifica*—Neuropodial spine from somite LXXV, $\times 250$.
Pista elongata—figs. 45–47.
 Figs. 45–47.—Uncini from somites V, XIV and XXV respectively, $\times 250$.
Pista alata—figs. 48–51.
 Fig. 48.—Limbate seta from somite XV, $\times 250$.
 Figs. 49–51.—Uncini from somite V, XV and XXX respectively, $\times 250$.
Polycirrus californicus—figs. 52, 53.
 Fig. 52.—Uncinus from XX, $\times 440$.
 Fig. 53.—Uncinus from XXXV, $\times 440$.
 Fig. 54.—*Polycirrus* sp.—Anterior uncinus, $\times 440$.
 Fig. 55.—*Notomastus tenuis*—Anterior abdominal crochet, $\times 440$.
 Fig. 56.—*Eunotomastus gordiodes*—Neuropodial crochet from somite XXV, $\times 360$.
 Fig. 57.—*Dasybranchus giganteus*—Corrected figure of crochet, $\times 360$.
 Fig. 58.—*Dasybranchus glabrus*—Neuropodial crochet from somite XXV, $\times 360$.
 Fig. 59.—*Sclerocheilus pacificus*—Quarter view of a posterior furcate seta, $\times 440$.
Trophonia capulata—figs. 60, 61.
 Fig. 60.—End of neuropodial seta from somite XXV, $\times 250$.
 Fig. 61.—Notopodial seta of same, $\times 56$.
Flabelligera commensalis—figs. 62, 63.
 Fig. 62.—Collar seta, $\times 56$; a, portion of same, $\times 250$; b, distal end of a sensory papilla from collar, $\times 56$.
 Fig. 63.—Neuropodial hook from somite XXV, $\times 83$.
Protula superba—figs. 64, 65.
 Fig. 64.—Shorter limbate seta from somite VIII, $\times 56$.
 Fig. 65.—Uncinus from somite XXV, $\times 360$.
Sabellaria californica—figs. 66a and b.
 Fig. 66a.—Palea of middle series of operculum, $\times 33$.
 Fig. 66b.—Same of inner series, $\times 33$.



MOORE CALIFORNIA POLYCHÆTA.



MOORE. CALIFORNIA POLYCHÆTA.

